SCIENCE

New Series
Vol. LV, No. 1435

Friday, June 30, 1922

Single Copies, 15 Cts.
Annual Subscription, $6.00

JUL 3 1922
GENERAL LIBRARY
JUL 3 1922
UNIV. OF MICH.

Saunders' Books

Wells' Chemical Pathology

FOURTH EDITION

This work considers pathology from the standpoint of the *chemical processes* involved. It deals with the chemical changes that take place in pathologic conditions. It treats of the *causes* of disease and so provides the first step in their treatment.
Octavo of 695 pages. By H. GIDEON WELLS, M.D., Ph.D., Professor of Pathology, University of Chicago. Cloth, $7.00 net.

Jordan's General Bacteriology

SEVENTH EDITION

In this work there are extensive chapters on methods of studying bacteria, including staining, biochemical tests, cultures, etc; on development and composition of bacteria; on enzymes and fermentation products; on the bacterial production of pigment, acid, and alkali; and on ptomains and toxins.
Octavo of 744 pages, illustrated. By EDWIN O. JORDAN, Ph.D., Professor of Bacteriology in the University of Chicago. Cloth, $5.00 net.

Smith's Bacterial Diseases of Plants

This book is the result of thirty-five years of reading and diligent laboratory and field investigation. It is largely the product of a single laboratory, eight of the organisms here selected for special study having been named by the author.
By ERWIN F. SMITH, in charge of Laboratory of Plant Pathology, Bureau of Plant Industry, Washington, D. C. Octavo of 688 pages, illustrated. Cloth, $10.00 net.

Whetzel's History of Phytopathology

Professor Whetzel divides his subject into Five *Eras*, and these in turn into *Periods*. He gives a general survey of each Era and each Period, crystallizes the evolutionary movement of each, gives interesting biographic sketches of the predominant figures, frequently including portraits.
12mo of 130 pages. By HERBERT RICE WHETZEL, Professor of Plant Pathology at Cornell University, Ithaca, New York. Cloth, $2.00 net.

Heineman on Milk

This work discusses milk from the viewpoint of the sanitarian, producer, and physician. There are chapters on the physiology of lactation, chemical, physical, and bacteriologic examinations, contamination, fermented milks, pasteurization, certified milk, economic aspect of production and distribution, etc.
By PAUL G. HEINEMAN, M. D., Wisconsin. Octavo of 684 pages, illustrated. Cloth, $7.00 net.

SIGN AND MAIL THIS ORDER FORM TODAY

W. B. SAUNDERS COMPANY, West Washington Sq., Phila.

Please send me the books checked (√) and charge to my account:—

Wells' Chemical Pathology.....$7.00 net.
Jordan's General Bacteriology.....$5.00 net.
Smith's Bacterial Diseases of Plants.....$10.00 net.
Whetzel's History of Phytopathology.....$2.00 net.
Heineman's Milk.....$7.00 net.

NAME.....

ADDRESS.....

The Trend of the Race

By Samuel J. Holmes

A study of the present tendencies in the biological development of civilized mankind, which makes available the latest results of scientific investigation.

396 pages, $4.00.

The Haunts of Life

By J. Arthur Thompson

The latest book of Prof Thompson, biologist and scientist, containing his popular lectures to young people before the Royal Institution of Great Britain. It discusses the evolution of the different types of animal life and how they live and rear their young, and is intended for adults as well as children. *Illustrated,* $2.50

Questions and Problems in Chemistry

By Floyd L. Darrow

A systematic development of elementary chemistry to be used with any text book.

80 Cents

Science and Human Affairs From the View Point of Biology

By W. C. Curtis

Prof. Zoology, University of Missouri

A scientist's answer to the evolution controversy.

$3.50

Fundamental Principles of Organic Chemistry

By Charles Moureu, College de France

Introductions by Sir William Pope

For advanced classes in Organic Chemistry.

399 pages, $2.75

Standard Works of G. Bell and Sons, London, Harcourt, Brace and Co.

X Rays and Crystal Structure

By Sir W. H. Bragg and W. L. Bragg

Illustrated, $3.75

Rest and Pain

John Hilton, F.R.S.

Twelfth edition, $3.50

Fundamental Conceptions of Psychoanalysis

By A. A. Brill, M. D.

An authoritative and interesting exposition of the theory and practice of psychoanalysis by Freud's chief American disciple.

344 pages, $2.50

Practical Biological Chemistry

By MM. Bertrand and Thomas of the Institute Pasteur

Translated by H. A. Colwell

A standard work on the chemical process manifested by living beings upon enzymes and upon the commoner forms of fermentation.

348 pages, $3.75.
(Ready in September)

Electrons: The Nature and Properties of Negative Electricity

By Sir Oliver Lodge

Fifth Edition. $3.50

Radium, X Rays and the Living Cell

Hector C. Colwell

With many plates; some in colors, $4.50

The Physiology of Blindness: With Special Reference to Color Blindness

W. Eldridge Green, M. D. $4.50

Letters of a Radio Engineer to His Son

By John Mills (Research Laboratories, Western Electric Company)

Letters to a real boy who wants to know every why and how of radio from the personal habits of electrons to buying and installing the outfit. Informal but authoritative. $1.50

Harcourt, Brace and Company

One West Forty-seventh Street, New York

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science, edited by J. McKeen Cattell and published every Friday by

THE SCIENCE PRESS

11 Liberty St., Utica, N. Y. Garrison, N. Y.
New York City: Grand Central Terminal

Annual Subscription, $6.00. Single Copies, 15 Cts.

Entered as second-class matter January 21, 1922, at the Post Office at Utica, N. Y., under the Act of March 3, 1879.

VOL. LV JUNE 30, 1922 NO. 1435

CONTENTS

The Relation of the Endocrine Glands to Heredity and Development: DR. LEWELLYS F. BARKER 685

An Analysis of Student Grades at Washington University School of Medicine: DR. M. F. WEYMANN 690

CHARLES BASKERVILLE: W. A. HAMOR 693

Scientific Events:

The Pension and Insurance Plan of Princeton University; Gifts to the American Museum of Natural History; The International Astronomical Union at Rome; Honorary Degrees conferred by Yale University on Scientific Men 694

Scientific Notes and News 697

University and Educational Notes 701

Discussion and Correspondence:

The New Catastrophism and its Defender: DR. ARTHUR M. MILLER. *Keys in Systematic Work:* E. B. WILLIAMSON. *The Y-centrosome Type of Sex-linked Inheritance in Man:* PROFESSOR W. E. CASTLE. *The Vocabulary of Metabolism:* DR. MAX KAHN. *Salaries of Professors in Poland:* PROFESSOR VERNON KELLOGG 701

Special Articles:

The Spiral Trend of Intestinal Muscle Fibers: DR. FREDERIC T. LEWIS. *Neartic Proturans:* H. E. EWING. *Stem End Rot of Apples:* DR. CLYDE C. BARNUM 704

The American Physiological Society: PROFESSOR CHAS. W. GREENE 708

THE RELATION OF THE ENDOCRINE GLANDS TO HEREDITY AND DEVELOPMENT[1]

SINCE the object of the Eugenics Research Association is the advancement of knowledge that will contribute to the improvement of the human race by inheritance, its members can scarcely fail to be interested in the discussions that are now going on regarding the glands of internal secretion and their relations to heredity. As a medical man, deeply interested in the problems of constitution and of condition and profoundly impressed with the recognizable influences of internal secretions upon form and function in both normal and pathological states, I welcomed the suggestion of Dr. Davenport that I deal in my presidential address with the topic announced. The progress of research in endocrine domains and in heredity has of late been so rapid that no single person can keep pace with its strides. My remarks, therefore, will make no pretence to completeness of discussion of the reciprocal relations of heredity and endocrinology. They are intended rather to direct the attention of the members of the association to some of the more important facts that have been established and to stimulate interest in some of the newer problems that are emerging and clamoring for solution.

THE ENDOCRINE ORGANS AND THEIR PRODUCTS

It is only comparatively recently that the significance of the so-called ductless glands and of the substances they manufacture has become recognized, but, in a very short time, a considerable body of knowledge concerning their structure, their functions and their inter-relations has been accumulated. At the moment, studies of the internal secretions, or, as many now call them, the "incretions," are, on ac-

[1] Presidential address at the tenth annual meeting of the Eugenics Research Association, held at Cold Spring Harbor, Long Island, June 10, 1922.

count of their astonishing and novel revelations, attracting the attention not only of scientific workers in biology and medicine but, and perhaps to too great an extent, also of the laity. Important as a knowledge of these incretions is for an understanding of bodily and mental states, there is some danger, I think, of over-emphasis and of disproportionate prominence. Popular articles and treatises on endocrine subjects too often assume what is mere conjecture, or wild speculation, to be established as fact and reveal a tendency to exploitation that must sooner or later be followed by disappointment and disillusionment. There is, I fear, some danger that even scientific endocrinology may, temporarily at least, be brought into undeserved discredit. It would seem especially desirable, therefore, that those who write or speak upon the subject should discriminate carefully between fact and fancy. Every effort should be made rigidly to control hypotheses by accurate observation and careful experiment, for only thus can an orderly advance in knowledge be assured.

Though an incretory function has been ascribed to many organs of the body, the principal incretory organs, those whose function is best understood, are seven in number: (1) the thyroid gland, (2) the parathyroid glands, (3) the hypophysis cerebri, or pituitary gland, (4) the epiphysis cerebri, or pineal gland, (5) the suprarenals (consisting of two parts of entirely different functions, (*a*) the medulla or chromaffine portion and (*b*) the cortex or interrenal portion), (6) the islands of Langerhans of the pancreas, and (7) the interstitial tissue of the gonads (ovaries and testicles) or so-called "puberty gland."

There is evidence that each of these organs yields an internal secretion that, distributed through the blood, exerts important chemical influences upon other, more or less distant, organs and tissues. Some of these influences have been definitely determined, but it will doubtless be a long time before all of them will be well understood. The knowledge that has been gained concerning the thyroid, the pituitary, and the suprarenals gives promise, however, that steady research will gradually enlarge our information regarding the influences exerted by each of the incretory glands.

The chemical substances contained in the incretions have been called "hormones" and the determination of the precise chemical constitution of these hormones sets fascinating tasks for the biochemist. That the chemical constitution of some endocrine products may be closely approached, if not definitely established, has been shown by researches upon epinephrin (from the medulla of the suprarenal gland) and upon iodothyrin and thyroxin (from the thyroid gland). Studies of concentrated functionally potent extracts from other glands may before long reveal the chemical nature of other hormones; I have in mind, especially, studies of so-called "pituitrin" (hypophyseal extract) and of so-called insulin (extract of the islands of Langerhans of the pancreas). Clues as to the chemical nature of the hormones of the parathyroids, the pineal body, the interrenals and the gonads will probably be more difficult to obtain. Biochemical researches to establish the precise nature of the single hormones are extraordinarily important and should be vigorously prosecuted in order that experimental studies of hormone influences may be more systematically, exactly and intelligently pursued.

THE BETTER-KNOWN ENDOCRINOPATHIES

Our knowledge of endocrine functions has been variously derived, partly through keen clinical-pathological observations, partly through experimental work upon animals (surgical removal of single organs; organ transplantations; injections of organ extracts or of isolated hormones). Before discussing the relations of the endocrine organs to heredity and development, it may be helpful briefly to refer to a few of the classical clinical syndromes that are now justifiably believed to be endocrinopathic in origin. Time will not permit me to refer to more than a few of these, but those chosen will serve as illustrative paradigms.

I may cite first two characteristic clinical syndromes met with in association with disease of the thyroid gland, namely, exophthalmic goitre and myxœdema.

In the former, known also as Graves' disease or Basedow's disease, we observe, in typical instances, a markedly enlarged pulsating thy-

roid gland (goitre) in the neck, a persistently accelerated pulse rate (say 150 or more to the minute instead of the normal rate of 72), marked nervous symptoms including fine tremor of the fingers, outspoken protrusion of the eyeballs (exophthalmos), a tendency to profuse sweats and to watery diarrhœa, sensitiveness to heat, a peculiar psychic over-alertness and apprehensiveness, and a tendency to rapid emaciation (despite an abundant food intake) associated with demonstrable acceleration of the rate of the basal metabolism. Since similar symptoms can be produced by feeding thyroid gland extract, it is believed that there is a hyperfunction of the thyroid gland (hyperthyroidism) in exophthalmic goitre.

In the idiopathic form of myxœdema (or Gull's disease) the clinical conditions are diametrically opposite to those in exophthalmic goitre. The thyroid gland is small, the pulse-rate is usually slow, the eyes look sunken (enophthalmos), the lid-slits are narrow, the bodily movements are slow and clumsy, the patient is mentally dull, forgetful and apathetic, there is sensitiveness to cold and a tendency to constipation, the hairs fall out, the skin is dry, thick and wrinkled and there is a tendency to obesity (despite a restricted food intake) associated with demonstrable retardation of the rate of the basal metabolism. Since patients with idiopathic myxœdema rapidly improve if they are fed the thyroid gland of the sheep, and since a condition precisely similar to it occurs if the thyroid gland be surgically removed (cachexia thyreopriva), it is believed that myxœdema is due to a hypofunction of the thyroid gland (hypothyroidism).

Two similarly contrasting clinical syndromes due to disorders of the hypophysis cerebri or pituitary gland may next be mentioned, namely, (1) gigantism and acromegaly, due to overfunction, and (2) Froehlich's syndrome of obesity with genital dystrophy, due to underfunction.

When there is overfunction of the pituitary gland in early life before the epiphyses of the long bones have united with the shafts of those bones there is over-stimulation of bony growth and the patient becomes excessively tall (gigantism). When the overfunction of the pituitary gland occurs in later life (after epiphyseal union), bony overgrowth is still stimulated but manifests itself in enlargement of certain parts of the skull and of the hands and feet (acromegaly). There is also enlargement of the tongue and of the internal organs (splanchnomegaly). The victim presents a very characteristic appearance. The face is hexagonal, the nose is broad, the chin is prominent and curved so as to bend sharply upward, the cheek bones are outstanding and the arches above the eyes are prominent. Looked at from the side, the face resembles that of Punch (nut-cracker profile). The hands are spade-like, the fingers are sausage-shaped, and the feet are huge.

On the other hand, when there is underfunction of the pituitary gland during development a condition (Froehlich's syndrome) in marked contrast to gigantism and acromegaly results. The skeletal development is defective, the growth of bone being less than normal. The patient is short in stature, the face remains child-like and the hands and feet are small (acromikria). The subcutaneous fat is markedly increased (obesity), and is distributed in an uneven way over the body, being most abundant on the abdomen, over the buttocks, and in the proximal portions of the extremities. The secondary sex characters either fail to develop or develop in a faulty way. The pubic and axillary hairs do not appear or are scanty. The external genitals remain in an infantile state. In young men the voice is high pitched and there is a lack of normal virility. In young women, the menstrual flow is scanty or absent.

Next, let us contrast two clinical pictures believed to depend upon disorders of the suprarenal capsules, (1) Addison's disease, met with in destruction of the suprarenals (hyposuprarenalism), and (2) pseudo-hermaphrodism, premature puberty, and hirsutism, met with in association with hyperplasias of the suprarenals (hypersuprarenalism).

In Addison's disease there is great weakness and prostration, associated with low blood pressure, diarrhœa and other digestive disturbances, chronic anæmia and often a peculiar bronzing of the skin (melanoderma).

On the other hand, in cases in which there is

believed to be overfunction of the suprarenals, the clinical picture is markedly different though it varies somewhat with the time of onset of the assumed hyperfunction. Should this occur during fœtal life, a pseudo-hermaphrodite appears, the person presenting the external genital appearances of one sex while possessing the internal sex organs of the other sex. When the overactivity exists soon after birth rather than before birth, puberty appears prematurely, a little girl of three or four menstruating regularly and exhibiting the bodily and mental attributes (sexually) of an adolescent, or a boy of seven presenting the external genitals and the secondary sex characters of an adult. Should the overactivity of the suprarenals not occur until adult life, it may reveal itself in a woman of middle age by the rapid development of hairiness over the body (hirsutism) and by the exhibition of masculine characteristics (virilism).

Other examples of clinical pictures might be mentioned but these few will suffice to illustrate the extraordinary mental and physical changes that may become manifest when there are disturbances of function of the endocrine organs.

CONSTITUTION AND THE ENDOCRINE ORGANS

Biologically considered, a developed human being, like all developed higher organisms, must be looked upon as the resultant of a long series of reactions between the zygote (fertilized ovum) and its environment. The germinal type or genotype, reacting with the surroundings, becomes the developed type or phenotype, in the case of human beings, the "realized person." The germ plasm provides the determining factors, the environment the realizing factors. Everything in the phenotype attributable to inheritance may be spoken of as "constitution," everything attributable to environment as "condition." Medical men as well as biologists must, then, when studying a person or a single organism, be interested in differentiating, when they can, what is "constitutional" from what is "conditional" in origin. In experiments upon animals and plants such a differentiation may be relatively easy; in studies of human beings it is always extremely difficult and, as regards many features, as yet wholly impossible.

The importance of constitution will need no emphasis among biologists who are predominantly students of heredity. Among medical men, too, throughout the centuries, especially among practitioners, there have always been those who have been fully aware of the significance of constitution and of its relation to disease-disposition. During the past fifty years, however, under the spell of bacterial and protozoan etiology, medical men have been so absorbed by studies of influences arising in the environment that they have, too often, forgotten to continue their investigation of influences of endogenous origin. For a time, it was almost taboo to speak of "constitution," or of "disposition," owing to a justifiable reaction, perhaps, against the earlier prevalent tendency to use these words as a mask for ignorance. Recently, however, there has been a welcome revival of studies of constitution. Now that facts that supply a scientific basis for a general pathology of constitution have been accumulated, we may look forward to a greatly increased interest among physicians in the part played by inheritance in disease. Indeed, during the past five years, several treatises upon this and allied subjects have been published; and we may expect, I think, during the period just ahead of us, many attempts to present, more systematically than hitherto, the rôle played by constitutional disposition in the pathogenesis of a whole series of diseases.

The chemical consideration of endocrine disorders, has in my opinion, given a strong impetus to this movement toward a revival of studies of the physiology and the pathology of constitution. For though the endocrine organs are, in some instances, accessible to trauma and to poisons and parasites that reach them through the blood-stream, diseases of these organs, especially those "idiopathic" chronic diseases that develop insidiously and give rise to the classical endocrine syndromes, appear to be, usually, of endogenous rather than of exogenous origin, that is to say, they develop as the results of special anomalies of constitution. This accounts for the fact that endocrinopathies tend to run in families, and the

interrelationships that exist among the different endocrine organs may explain why a disease of the thyroid (exophthalmic goitre) may appear in one member of a family, a disease of the pancreas (diabetes mellitus) in another, a disease of the hypophysis (dystrophia adiposogenitalis) in a third, or a pluriglandular disorder in a fourth member of the same family. The experienced clinician can now often recognize phenotypes in which there are anomalies of constitution that predispose to endocrine disorders; and as a result of this recognition he may, sometimes, be able to institute a rational prophylaxis. The thyreotoxic constitution, the hypothyreotic constitution, the hypoparathyreotic constitution, the hyperpituitary constitution, the hypopituitary constitution, the hypergenital constitution and the hypogenital constitution are instances in point. Unfortunately we have not learned as yet how effectually to intervene in a prophylactic way in all of these anomalies of constitution, but rewarding experiences with the hypothyreotic and with the hypoparathyreotic constitution give us hope that, with widening knowledge, suitable preventive measures will be discovered.

Studies of the symptoms of endocrine disorders and studies of partial anomalies of constitution affecting the endocrine organs are thus throwing much light not only upon (1) the mode of action of the incretions, but also upon (2) inheritance as a determining cause of endocrinopathic phenotypes. The incretions may affect distant parts directly, being carried to them by the blood; or they may affect those parts indirectly through the intermediation of the autonomic nervous system, which they sensitize. When they act directly, they may influence the substances and processes in the localities that they reach (chemical correlation; regulation of metabolism) or they may supply materials for incorporation by the cells (nutritive and formative influences). When they act indirectly through the vegetative nervous system they may exert profound effects through the secretory activity of glands, through the contraction of smooth muscle, or through modifications of those neural mechanisms that have to do with the emotions and the will. During the developmental period, it is clear that the incretions are in part responsible for the dimensions and proportions of the skeletal apparatus and the soft parts. A normal functioning of the incretory organs is essential for the shaping of parts and for the maturing of functions in the right place and at the right time. Through correlative differentiation (due in part at least to the action of the incretions), the developing organism gradually comes to exhibit the characteristics of its species, its age and its sex. Even the anthropologists now maintain that the solution of the problem of how mankind has been demarcated into types so diverse as the Negro, the Mongol and the Caucasian will involve the study of hormonic mechanisms!

CAN HORMONES MODIFY UNFERTILIZED GERM-CELLS SO AS TO INFLUENCE INHERITANCE

Thus far in our discussion of the relation of the endocrine glands to heredity and development we have confined our attention to (1) the genotypic determination of endocrine functions in developing organisms, (2) the rôle played by the incretions in normal and pathological ontogeny, and (3) the fact that there exist heredo-familial anomalies of body make-up that predispose to endocrine disorders. But we must, for a few moments at least, consider the possibility that hormones, reaching unfertilized germ-cells, may modify the germ plasm in such a way as to give rise to new inheritance factors that will be transmitted from generation to generation.

Experiments upon the influence of incretory substances upon the development of cold-blooded animals have yielded such striking results upon cells of the soma that many have wondered whether incretions circulating in the blood might not also permanently alter the germ-cells so as to account in animals for the origin of mutations and new biotypes. You will recall the experiments to which I refer (1) the acceleration of tadpole metamorphosis by feeding thyroid substance and (2) the retardation of the same process by feeding thymus substance.

In endocrine diseases of either endogenous or exogenous origin, the cells of the soma are also markedly altered; and the question has naturally been asked, May not the germ-cells be simultaneously profoundly changed?

Since 1895, a number of investigators have suggested that the influence of specific internal secretions might easily be used for the explanation of the inheritance of acquired characters. Last year, an English evolutionist published a volume on "Hormones and Heredity" and suggested that environmental influences infiuencing an organ, or part, of the mother may set free chemical substances (hormones) that, carried through the blood to the ovaries, may affect the ova in such a way as to lead to similar changes in the same organ, or part, of the offspring. By such a mechanism he would attempt to account for a progressive evolution in the animal series. His theory would seem practically to be a modfiication of the pangenesis theory of Darwin with the substitution of "hormones" for Darwin's "gemmules."

Many physicians, too, have leaned toward Lamarckian or neo-Lamarckian theories that assume the inheritance of acquired characters and some of these have suggested that in such inheritance the incretions must be concerned. Those who have been trained in the methods of modern biology, however, usually reject Lamarckism, and attempt to explain the apparent inheritance of "acquired characters" for a generation or two by assuming either a "germinal injury" (in the sense of Forel's "blastophthoria") or a "parallel induction."

The consensus of biological opinion in this country is strongly opposed to the inheritance of acquired characters. Mendelian studies lend no support to the view that conditional influences can affect inheritance factors. Mendelism is, however, difficult if not impossible to apply to man. As some one has put it, "the propagation of man consists of a continual crossing of polyhybrid heterozygote bastards," not susceptible to analysis by Mendelian methods such as can be applied to the study of the propagation of plants and experimental animals. But if inheritance of acquired characters really occurred, why should there not be, as Conklin emphasizes, an abundance of positive evidence to prove it? When one plant or animal is grafted on another, there is no evidence that the influence of the stock changes the constitution of the graft. When an ovary is transplanted, the foster mother does not affect the hereditary potencies of the ova. Until more proof has been brought than has hitherto been advanced, we shall not be justified, so far as I can see, in accepting the theory that conditional influences change hereditary factors. There are, moreover, aside from the problem of the inheritance of acquired characters, enough relationships of the endocrine organs to heredity and development to long keep us rewardingly occupied.

CONCLUSION

Let me summarize in a few words the situation as I see it. The endocrine organs are of the greatest importance in normal development, their incretions exerting profound formative and correlative influences. In pathological development, the abnormal plenotypes that appear often point decisively to partial anomalies of constitution involving especially the ductless glands and their functions. Whether or not under normal or pathological conditions, hormones arising in the soma can so change the germ plasm of ova or sperm-cells as to account for certain mutations or for germ-cell injury is a question that deserves consideration and merits experimental test. Finally, the conjecture that conditional influences upon the soma can through hormonal production and transportation to parental gametes so modify the germ-plasm as to result in the inheritance of the conditioned modification seems, as yet, to have but little, if any, evidence to support it.

LEWELLYS F. BARKER

BALTIMORE, MD.

AN ANALYSIS OF STUDENT GRADES AT WASHINGTON UNIVERSITY SCHOOL OF MEDICINE

THIS work was undertaken with the idea of obtaining some definite data upon which to base opinions of students' grades during their medical course. As the data obtained were of great interest to the staff of this school it was thought advisable to publish them in order that they might be used for comparison with those of other schools.

The records of those students in the classes of 1914, '15, '17, '19, '20 and '21 who spent all

four years of their course in Washington University Medical School were studied. The class records before 1914 were not complete enough to average with the later records. The class of 1916 had only two members who spent all four years in this school, these records not being complete, and the class of 1918 finished its course in France, so these two classes were not considered in the analysis. In the six classes studied there were available the records of 89 students. From these records were copied the average for each year, the graduation age, degree at matriculation, and the school in which premedical training was taken.

In considering the graduation age of the students it was found that there was little variation from one year to another. The average graduation ages for the classes studied beginning with that of 1914 were 25, 26, 25½, 26, 26, and 24 years, respectively. Thus the average graduation age of the 89 students was approximately 25½ years. The variation between individuals was so slight that no relation between age and grade was worked out.

The number of students possessing bachelor's degrees upon matriculation was 14, or 15.73 per cent. of those studied. Eleven were A.B. degrees and three B.S. degrees. One might have expected a larger percentage of bachelor of science degrees from students interested primarily in the sciences. The average graduation age of these students was 26.64 years, or 1.35 years older than that of those without degrees. The average grade of the group with degrees was 82.21 per cent. as contrasted with 80.89 per cent. for that without degrees. Thus we see that the average man with a degree upon matriculation was 1.35 years older than the man without one, but that his grade was 1.32 per cent. higher than that of the undergraduate student. Is an increase of grade of 1.32 per cent. worth a time loss of 1.35 years in a medical student's career?

The grade averages by years for each class are given in Table I. Here we see that there is not much variation between the classes of the years studied. This fact would indicate that a uniform system of grading had been used for all classes, providing the class of stu-

TABLE I

Class	Av. Year I	Av. Year II	Av. Year III	Av. Year IV
1914	77.87%	80.31%	79.95%	82.11%
1915	79.21%	79.76%	84.51%	83.60%
1917	78.28%	78.81%	81.75%	84.02%
1919	76.67%	79.84%	81.45%	85.52%
1920	77.62%	81.48%	82.18%	83.68%
1921	79.80%	81.33%	81.96%	84.73%
Total Av.	78.24%	80.26%	81.97%	83.93%

General average for all classes for four years = 81.10%.

TABLE II

Amount of Variation	Per Cent. of Students							
	Year I-II		Year II-III		Year III-IV		Year I-IV	
	+	−	+	−	+	−	+	−
0-1%	3.41	12.50	6.82	5.68	8.99	5.62	7.78	4.50
1-2%	10.02	6.82	10.02	6.82	16.85	6.74	3.37	2.25
2-3%	3.41	5.68	9.09	11.36	10.11	3.37	5.62	2.25
3-4%	5.68	11.36	9.09	6.82	8.99	6.74	5.62	1.12
4-5%	6.82	.....	7.95	2.27	8.99	.....	7.78	4.50
5-6%	9.09	2.27	7.95	1.14	10.11	1.12	3.37	.....
6-7%	4.55	1.14	3.41	.....	4.50	1.12	8.99	.....
7-8%	2.27	.....	3.41	1.14	4.50	.....	4.50	.....
8-9%	4.55	.....	2.27	1.14	1.12	.....	10.11	1.12
9-10%	4.55	.....	1.14	.....	.....	.....	4.50	.....
10-11%	1.14	.....	1.14	.....	1.12	.....	4.50	.....
11-12%	3.41	.....	1.14	.....	.....	.....	1.12	.....
12-13%	1.14	.....	.....	.....	.....	.....	6.74	.....
13-14%	.....	.....	.....	.....	.....	.....	2.25	.....
14-15%	.....	.....	.....	.....	.....	.....	2.25	.....
15-16%	.....	.....	.....	.....	.....	.....	.....	.....
16-17%	.....	.....	.....	.....	.....	.....	1.12	.....
17-18%	.....	.....	.....	.....	.....	.....	1.12	.....
18-19%	.....	.....	.....	.....	.....	.....	2.25	.....
19-20%	.....	.....	.....	.....	.....	.....	1.12	.....

dent remained the same for each year. There is a gradual increase in the general average from the first to the fourth year of 4.69 per cent. As the same students are present throughout all four years, this either shows an improvement in the student's ability or, more likely, severe grading during the first years or lax grading during the last years of the course. The general average of the entire group for all four years is 81.10 per cent., which is a low B grade in our letter system. This gives us a numerical figure for our average students in the future.

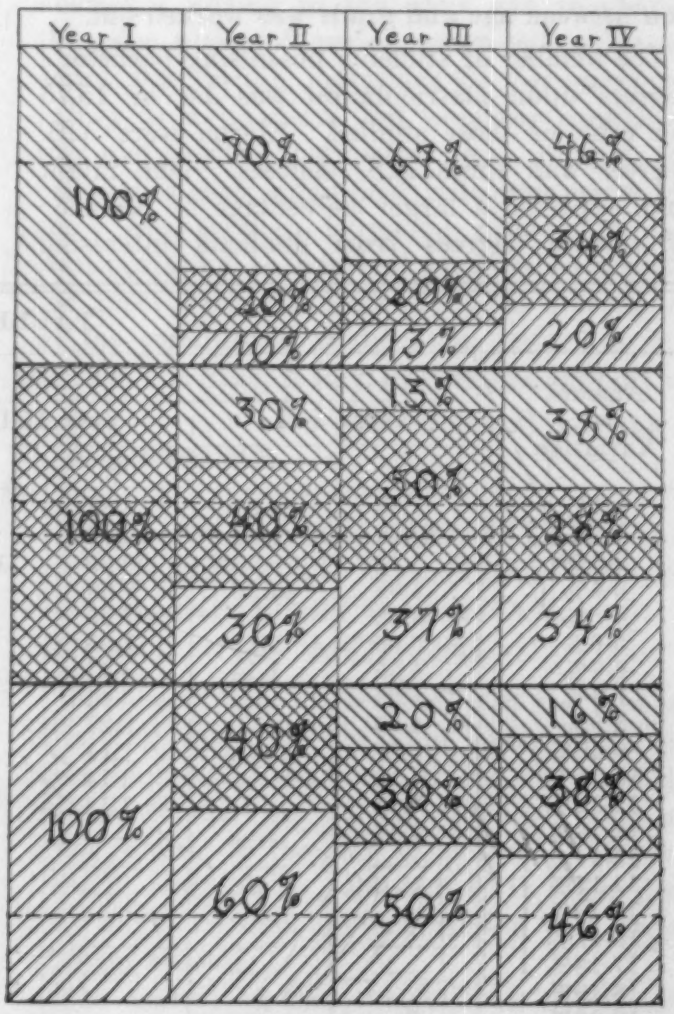
There was a great tendency toward variation in the grades of an individual from one year to the next. This is well shown in Table II in which the per cent. of students varying a given percentage in grade, either up or down, between the different years of the course is shown. There is always a larger proportion of the class showing an increase in grade as would be expected from the increase in general average. To show how inconstant the grades are from year to year we note that more than 36 per cent. of the students have a difference of over 8 per cent. between first and fourth year averages, and indeed, 3.62 per cent. show a difference of over 18 per cent.

In Table III the rank of the student in his class is considered. The men of each class were arranged according to rank, based on their first year averages, and the class then split into thirds, an upper, middle, and lower third. Each third was now considered 100 per cent. and the upper represented by left diagonal lining, the middle by cross hatching, and the lower by right diagonal lining. The proportion of the men of the upper third during the first year who fell into the middle third the second year is represented by the area of left diagonal lining in the middle division under year II. Similar changes in other groups may be followed in the same manner. It is obvious that a man might go from group 1 to group 2, then back to group 1 the third year, so that the left diagonal lining in group 1 for the third and fourth years does not represent the percentage of men who remained there constantly for four years, but that portion of the men who started in group 1 the first year who are there in the year observed. Therefore the interrupted line was inserted in order to indicate the percentage of men in each division who remained there constantly for every one of the four years.

This table shows that the upper and lower thirds of the class are the most constant in their rank, for 36 per cent. remained in the upper third constantly and 27 per cent. in the lower, while only 10 per cent. of the middle third remained there for four years. Those students who drop from the upper to lower third in the third year may be the ones primarily interested in the fundamental sciences, and not in clinical work. There are usually one or two such individuals in each class. We do get a surprising revelation of the inconstancy of a large proportion of the class.

Only 24.7 per cent. of the group studied remained constantly in one division for four years, 57.3 per cent. went up or down one division, and 18 per cent. up or down two

TABLE III



divisions during the course. This shows that no class could have been even approximately grouped for the entire course on the basis of the first year's averages.

Finally those men in the group who had first year averages of less than 72 per cent. were picked out. It was thought that these were the borderline men, students who might have been dismissed from school had their grades been only one or two per cent. lower. The object was to observe the further progress of this group with regard to the other students. There were 15, or 16.8 per cent., of the students with a first year average under 72 per cent. Forty per cent. of them had their premedical training at Washington University, 40 per cent. at the smaller colleges, and 20 per cent. at state universities.

At the end of the fourth year 40 per cent. of these men had grades above the average for the senior year, 20 per cent. ranked in the upper third of the senior class, 27 per cent. in the middle third, and only 53 per cent. in the lower third. Of the 20 per cent. in the upper third of the senior class, one third had premedical training at Washington University, one third at a small college, and one third at a state university. The middle and lower thirds were equally divided between the small colleges and the universities. So it would seem that if poor preliminary training were the cause for the low first year average of these students we must blame the universities equally with the smaller colleges, for the percentage of advance in grade was equally divided between students from Washington University and such colleges as Central, Missouri Valley, Southwestern, and Christian Brothers'.

As almost 50 per cent. of these men who might easily have been dismissed from school on their first year's record made mediocre and even excellent students during their senior year, the question arises as to how many of the men with first year grades just below 70 per cent. who are now dismissed from school might reach the upper third of their class were they allowed to remain. Can we say it would be less than 20 per cent.? Yes, because many questions are considered in giving a student a grade just under or just over 70 per cent., amongst them being just this possibility of improvement. However, these figures should make us in the future think even more carefully before declaring a student unfit for the study of medicine on the basis of his first year's record.

M. F. WEYMANN

WASHINGTON UNIVERSITY
SCHOOL OF MEDICINE

CHARLES BASKERVILLE

THE death of Charles Baskerville, last January, was a great calamity to the chemical profession. His end was premature—he was nearing 52 years of age—and it brought a poignant sense of bereavement to his numerous friends. He did not live to see his life's work done, but he departed from a world which will evermore be the richer for having once had him.

Deeply and peculiarly American, an aristocrat by birth, Charles Baskerville was nevertheless broad and cosmopolitan in all his educational work, and honored by his students, pedagogic associates and professional colleagues. A man of high quality whose poise and personality early established leadership, his cheerfulness, sympathetic helpfulness and constant productivity brought the admiration and respect of all who had the privilege of being near him.

For thirty years Charles Baskerville occupied a prominently successful position in chemical education (University of North Carolina, his *alma mater,* 1891-1904; College of the City of New York since 1904); but, in addition, he found time for the conduct of original researches of value (first on the rare earths and later on the chemistry of anesthetics), while his inventions in the refining and hydrogenation of vegetable oils, plastic compositions and reinforced metals are of recognized industrial importance.

In addition to 190 educational, scientific and technologic papers, Charles Baskerville was the author of the following books: "School Chemistry," 1898; "Key to School Chemistry," 1898; "Radium and Its Applications in Medicine," 1906; "General Inorganic Chemistry," 1909; "Laboratory Exercises" (with R. W. Curtis), 1909; "Progressive Problems in Chemistry" (with W. L. Estabrooke), 1910; "Quali-

tative Analysis" (with L. J. Curtman), 1910; "Municipal Chemistry" (with other experts), 1911; and "Anesthesia" (with J. T. Gwathmey), 1914.

Charles Baskerville became a member of the American Chemical Society in 1894 and later, as councilor and chairman of important committees, rendered much valuable service. His activities on the society's committee on occupational diseases in the chemical industries were especially prominent. He was one of the most constant attendants upon the annual meetings, effectively laboring for the best interests of the society. He was also a fellow of the London Chemical Society, a member of the Society of Chemical Industry, of the American Institute of Chemical Engineers, of the American Electrochemical Society, of the Washington and New York Academies of Science, of the Franklin Institute, and of the American Association for the Advancement of Science.

Charles Baskerville's great forte was in making practical suggestions for the better conduct of affairs. At North Carolina and later at the College of the City of New York, he was respected as an able teacher who kept in close and sympathetic touch with his students; but he did not confine himself to the teaching side of education. Upon the completion of the chemical laboratory of the College of the City of New York, which he designed, he took rank among the foremost laboratory directors of the United States. He was indeed an organizer and administrator of the highest order. Indomitably energetic in his executive duties, and aided by an active staff of carefully selected chemical specialists, he succeeded in establishing and operating a strong department, and in consequence his influence extended throughout the institution. Constantly alert to help and keenly interested in bettering conditions, his accomplishments for his associates were numerous. His most attractive personal characteristics led to friendships of weight, which, in turn, benefited his colleagues and students.

An intellect more powerful from its happy union of scientific ability with broad culture has probably not been seen in the American chemical profession. He was inferior to none in extent of literary acquirement, in penetrating and fertile executive ingenuity, and in general equipoise of mind. And withal he tried to be his "own man," generous, kindly and sympathetic. The spirit of goodness is ever the same; but the modes of its manifestation are numberless, and every sterling man is original. The vigor and sincerity of this sterling man made his friendship a treasure.

W. A. Hamor

SCIENTIFIC EVENTS

THE PENSION AND INSURANCE PLAN OF PRINCETON UNIVERSITY

A pension and insurance plan for the Princeton University teaching staff was adopted on June 19 by the board of trustees at their annual meeting, held in connection with the university's one hundred and seventy-fifth commencement exercises. It provides for the raising of a special fund of $1,000,000 not later than 1925, to provide the money that will be required under the trustees' action.

The plan, which was placed before the trustees by a special pension committee of which John O. H. Pittney is chairman, supplements the provisions of the Carnegie Foundation, of which about 90 per cent. of the faculty are at present beneficiaries.

Any member of the university teaching staff may, under the plan approved, retire at the age of 65, and every member must retire at 68, provided, however, that in special cases by a vote of the board of trustees an individual may be continued in active service beyond the retiring age period not exceeding three years.

The general provisions of the plan are as follows:

Every member so retiring shall be entitled to receive during the remainder of his life an annual retiring allowance equal to one half of his annual salary as teacher at retirement:

Provided that the obligation of the university shall be reduced by the amount of any Carnegie or similar allowance to which any such member may be entitled. Any member so retiring, not immediately entitled to a Carnegie allowance, shall receive from the university his half salary as before defined (with such additions thereto as may be necessary to qualify him for the maximum Carnegie allowance) until he is entitled to maximum allowance under the Carnegie rules. Any

member of the teaching staff who is entitled to a Carnegie retiring allowance and who forfeits such retiring allowance because of any voluntary act by which the same is forfeited under the Carnegie rules, may be deprived of his retiring allowance from the university.

The university will provide life insurance that shall assure to each member of the teaching staff the payment of $5,000 on his death before his retirement, payable to his wife if he leaves one, otherwise to his children, or, if he leaves none, then to such person as he may, with the approval of the president, designate.

"An alternative" plan" submitted by the committee on pensions and also approved covers the cases of members of the faculty who hold deferred annuity policies issued by the Teachers' Insurance and Annuity Association of America or other companies approved by the university finance committee. The university will, on the request of a member of the faculty and his relinquishment of all benefits under the insurance and pension plan, contribute toward the payment of the premiums on such annuity policies a sum not exceeding five per cent. of his annual salary, nor a maximum of $300.

GIFTS TO THE AMERICAN MUSEUM OF NATURAL HISTORY

GIFTS of $1,000,000 by Mr. John D. Rockefeller, Jr., and $250,000 by Mr. George F. Baker to the American Museum of Natural History were announced by President Henry Fairfield Osborn at a meeting of the executive committee of the board of trustees last week, when the following resolutions were passed:

Resolved, That the trustees accept with grateful thanks the splendid gift of $1,000,000 presented to the museum by Mr. John D. Rockefeller, Jr., for its corporate purposes and hereby take pleasure in applying it to the permanent endowment fund, the principal to be kept invested and the income only to be expended for the work of the institution.

This munificent gift, valued at more than a million dollars, is the more appreciated because it is received at a time when the increase of the permanent endowment by at least $2,000,000 stands as the paramount need of the museum, in order that its scientific exploration and research may not be curtailed and in order that it may continue to render to public education, especially through the school system of the city and country, a service which is increasing in importance and is receiving universal approval of educators.

Mr. Rockefeller's attitude in his generous terms of gift and in his liberal-mindedness with respect to the use of this fund is a further source of deep satisfaction and encouragement to the trustees because it indicates his hearty endorsement of the aims and purposes of the museum and of the trustees' policy in its development and expresses his belief in the present and future service which it can render to science and education for all the people.

In recognition of Mr. Rockefeller's interest in the museum, the trustees take pleasure in hereby electing him a benefactor.

Resolved, That the trustees desire to record their deep sense of gratitude to Mr. Baker for his generous gift of $250,000, which constitutes the initial contribution to the much needed enlarged endowment for the growth and development of the museum. The trustees deeply appreciate not only the intrinsic value of the gift, but especially the generous attitude of the donor in permitting the unrestricted use of the income of this fund—an action which is indicative of his confidence in the administration of the museum and the aims and purposes of the institution. In recognition of Mr. Baker's earlier contributions, the trustees had previously elected him a benefactor, and can therefore merely express their gratitude to him by extending their heartfelt thanks and best wishes for continued good health and happiness.

THE INTERNATIONAL ASTRONOMICAL UNION AT ROME

AT the meeting of the International Astronomical Union at Rome from May 2 to 10, according to a report in *The Observatory*, the adherent countries represented were Australia, Belgium, Brazil, Canada, Czecho-Slovakia, Denmark, France, Great Britain, Holland, Italy, Japan, Mexico, Norway, Poland and the United States. Greece and South Africa, though adhering to the union, were not represented, while Roumania and Spain were represented, although the formalities connected with adhesion to the union had not been completed.

The list of committees for the coming three years drawn up by the executive committee was adopted. They were as follows, the name of the chairman being given in each case:

Relativity, Levi-Civita (Italy); Notations, Stroobant (Belgium); Ephemerides, Eichelberger (U. S. A.); Bibliography, B. Baillaud (France); Telegrams, Strömgren (Denmark); Dynamical Astronomy, Andoyer (France); Instruments, Hamy (France); Solar Physics, Hale(U. S. A.); Wave-lengths, St. John (U. S. A.); Solar Rotation, Newall (Great Britain); Physical Observations of Planets, Comets and Satellites, Phillips (Great Britain); Lunar Nomenclature, Turner (Great Britain); Wireless Determination of Longitude, Ferrié (France); Variation of Latitude, Kimura (Japan); Positions of Planets, Comets and Satellites, Leuschner (U. S. A.); Shooting Stars, Denning (Great Britain); Carte du Ciel, Turner (Great Britain); Stellar Parallaxes, Schlesinger (U. S. A.); Photometry, Seares (U. S. A.); Double Stars, Aitken (U. S. A.); Variable Stars, Shapley (U. S. A.); Nebulæ and Clusters, V. M. Slipher (U. S. A.); Spectral Classification, Adams (U. S. A.); Radial Velocities, Campbell (U. S. A.); Time, Sampson (Great Britain).

Sir Frank Dyson gave, on behalf of the delegates of Great Britain and, more particularly, on behalf of Professor Newall, an invitation to the union to meet in Cambridge in 1925, and also to be present at the celebration of the two hundred and fiftieth anniversary of the foundation of the Royal Observatory, Greenwich. This invitation was seconded by Mr. Stratton, and was accepted after invitations from Poland and eastern center in the United States had been noted for 1928. The following were elected to act as officers and executive of the union for the coming three years:

President: Professor W. W. Campbell (U. S. A.).

Vice-presidents: Professor Cerulli (Italy), M. Deslandres (France), Professor Hirayama (Japan), Mr. Hough (Great Britain), Professor de Sitter (Holland).

Secretary: Professor Fowler (Great Britain).

HONORARY DEGREES CONFERRED BY YALE UNIVERSITY ON SCIENTIFIC MEN

AT the commencement exercises of Yale University on June 21, President James Rowland Angell conferred the honorary doctorate of science upon Dr. John C. Merriam and Mr. J. J. Carty and the doctorate of laws on Dr. Russell H. Chittenden. In presenting the candidates for the degrees Professor William Lyon Phelps spoke as follows:

JOHN CAMPBELL MERRIAM: President of the Carnegie Institution, paleontologist and educator. Born in Iowa, where he took his first degree at Lenox College in 1887. Doctor of philosophy of the University of Munich. He began his professional career as an instructor in paleontology and historical geology at the University of California in 1894, and since that date he has become a leading authority in fossil reptiles and fossil mammals of western North America, and of general historical geology of the Pacific coast region. He is a member of many learned societies and his publications are numerous and important. He was for years professor of geology and dean of the faculties at the University of California. He was largely instrumental in establishing the Pacific exploration project which has taken on large dimensions, involved wide ranges of science and large numbers of scientists. During the late stages of the war, he acted as chairman of the National Research Council. He is a member of the National Academy of Sciences and widely regarded by scientific men as one of the half dozen conspicuous representatives of American science. He combines to an extraordinary degree ability as an investigator with ability as a teacher.

JOHN JOSEPH CARTY: Vice-president of the American Telephone and Telegraph Company, A pioneer in the development of telephone science since 1879. He designed and constructed the first metallic circuit multiple telephone switchboard. A high authority states that his original researches published in 1889 demonstrate the preponderating effect of electrostaic induction in producing cross-talk on adjacent telephone circuits. Cross-talk is presumably used only in a technical sense. He invented the method of common battery work now in general use throughout the world. The bridging telephone was designed by him; this forms the basis of all farmers' party-lines, thus adding social knowledge and delight to the existence of farmers' wives. He is a leader in the movement to encourage research in pure science at the universities. During the war he was chairman of the executive board of the National Research Council. He rendered invaluable service in preventing the interruption by the enemy of our trans-Atlantic cable communications. He designed the telephone and telegraph system for the American Army in France. He served as colonel in the United States Army as a staff officer, and is now brigadier-general of the Officers' Reserve Corps. For his services in establishing

the telephone system in Japan, he received there the Order of the Rising Sun and of the Sacred Treasure. For his war services, he was given the formal thanks of the French Army, the cross of Officer of the Legion of Honor and the Distinguished Service Medal from the United States government.

RUSSELL HENRY CHITTENDEN: Dr. Chittenden was born in New Haven, and his active career has been identified with the Sheffield Scientific School, a fortunate thing for that institution. He took his bachelor of philosophy degree there in 1875. After taking his doctorate in the Graduate School, he studied at Heidelberg, and has received honorary degrees from the University of Toronto, University of Pennsylvania, Washington University, and the University of Birmingham in England. His researches and publications in the field of physiological chemistry have made him one of the world's foremost authorities; and during the war he represented America on the Inter-Allied Scientific Food Commission, which held sessions in London, Paris and Rome. In 1898 he was appointed director of the Sheffield Scientific School, where he immediately showed executive ability as remarkable as his powers of research. Under his leadership the Sheffield Scientific School became a liberal college, one of the best in America, where the study of the humanities had no stronger friend than the great scientist who directed the institution. Its growth in numbers and in buildings and in resources was phenomenal; leading authorities were numerous on the faculty, Dr. Chittenden's devotion to the avocation of fishing enabling him to be a good fisher of men. He retires from office this year in the plenitude of his powers, with the respect of the best scholars in Europe and America, with the admiration of his colleagues, and with the devoted affection of thousands of students who have been graduated under his administration.

SCIENTIFIC NOTES AND NEWS

PROFESSOR T. H. MORGAN, of Columbia University, was on June 1 formally received into the Royal Society and delivered the Croonian lecture. On the following day he and Dr. Sturtevant addressed the Genetical Society at its annual meeting, held at the John Innes Horticultural Institution. On June 8, Professor Morgan lectured at the University of Edinburgh and its degree of doctor of laws was presented to him.

DR. GEORGE ELLERY HALE, director of the Mount Wilson Observatory and honorary chairman of the National Research Council, has been elected the American representative on the international committee which, under the auspices of the League of Nations, is to study and suggest methods of intellectual cooperation throughout the world.

AT the commencement exercises of Princeton University, the doctorate of science was conferred on Dr. Arthur Gordon Webster, professor of physics at Clark University; Dr. Henry Crew, professor of physics at Northwestern University, and Dr. John Campbell Merriam, of the Carnegie Institution of Washington. The doctorate of laws was conferred on Dr. Livingston Farrand, president of Cornell University.

DR. VERNON KELLOGG, of the National Research Council, was given the honorary degree of doctor of science by Oberlin College on June 21.

THE honorary degree of doctor of laws was conferred on the secretary of agriculture, Henry C. Wallace, by the Iowa State College of Agriculture and Mechanics Arts at the commencement this month. Secretary Wallace is an alumnus of the institution and gave the commencement address.

DR. HAROLD L. AMOSS, associate member of the Rockefeller Institute for Medical Research, New York, on June 7 received the degree of doctor of science from George Washington University, Washington, D. C. The scientific staff of the Rockefeller Institute on June 12 gave a dinner in honor of Dr. Amoss, who has accepted the appointment of associate professor of medicine at the Johns Hopkins Medical School, Baltimore.

AMONG those knighted on the occasion of King George's birthday were Professor William Maddock Bayliss, professor of general physiology in University College, London; Professor Frederick William Keeble, Sherardian professor of botany at Oxford University, and Dr. Edward John Russell, director of the Rothamsted Experiment Station.

A COMPLIMENTARY dinner was given to Dr.

Henry Head, F.R.S., on May 26 in recognition of his eminent services to neurology as editor of *Brain* for seventeen years. Sir Charles Sherrington, president of the Royal Society, was in the chair and addresses were made by Sir David Ferrier and Dr. Head. Dr. Gordon Holmes has been made editor of the journal.

DR. LEON C. HAVENS, associate in immunology in the Johns Hopkins School of Hygiene and Public Health, has been appointed director of laboratories of the State Board of Health at Montgomery, Alabama.

H. A. NOYES has severed his connection with the Mellon Institute of Industrial Research of the University of Pittsburgh to accept the position of research chemist for the Michigan Department of Agriculture.

J. A. MCCLINTOCK, plant physiologist at the Georgia Experiment Station, has resigned, effective July 1, to accept the position of associate plant pathologist at the University of Tennessee Agricultural Experiment Station.

DR. CHARLES D. WALCOTT, secretary of the Smithsonian Institution, has left for the Canadian Rockies to continue geological explorations.

PROFESSOR J. G. NEEDHAM, head of the department of biology and entomology in Cornell University, is to exchange for the college year 1922-3 with Dr. William A. Hilton, of the department of zoology, Pomona College, Claremont, California.

DR. G. CANBY ROBINSON, acting professor of medicine at the Johns Hopkins University during the current year, will spend the summer in study at the University of Copenhagen before assuming his duties as professor of medicine at Vanderbilt University.

DR. JOHN RICE MINER, associate in the department of biometry and vital statistics of the School of Hygiene, the Johns Hopkins University, has been granted leave of absence for the next academic year and will spend the time in study and travel abroad. During Dr. Miner's absence, his position in the department will be filled by Dr. Flora D. Sutton, who has the degree of doctor of philosophy in mathematics from Johns Hopkins University, and has for some time been connected with the department of biometry and vital statistics.

DR. J. W. TURRENTINE, formerly director of the Experimental Kelp-Potash Plant of the U. S. Department of Agriculture at Summerland, California, has obtained furlough from the department for a period of six months to act as consulting chemist for the U. S. Kelp Products Corporation, the newly organized concern which has purchased the government's plant and is now proceeding with the manufacture of kelp products.

PROFESSOR FRANK THILLY, professor of philosophy at Cornell University left on June 8 for Houston, Texas, to give the commencement address at the Rice Institute. From Houston he plans to go to Los Angeles to give a course of lectures before the Summer School of the Southern Division of the University of California.

ON June 6, at the Denver Public Library, Dr. C. P. Gillette, director of the Colorado Agricultural Experiment Station, delivered a lecture on "Heredity and the improvement of man," under the auspices of the Genetic Foundation of Colorado.

PROFESSOR EUGENE C. BINGHAM gave an illustrated lecture in Philadelphia on the evening of June 15 before the Philadelphia Section of the American Chemical Society on the subject of "Fluidity and plasticity."

A MENDEL festival was organized at Vienna by the Zoologic-Botanical Society to commemorate the hundredth anniversary of the birth of Gregor Johan Mendel on June 7.

DR. WILLIAM CARRUTHERS, from 1859 to 1895 assistant and keeper of botany in the British Museum, known for his work in paleobotany, died on June 2, at the age of ninety-two years.

PROFESSOR WILLIAM GOWLAND, emeritus professor of metallurgy in the Royal School of Mines, London, has died at the age of seventy-nine years.

THE deaths are also announced of Professor C. V. Zanetti, director of the Institute of Pharmacological Chemistry of the University of

Parma, and of Professor Jenö Holzwarth, who held the chair of radiology in the University of Budapesth.

A CABLEGRAM from Prague announces that Professor Edmund Weil has died from typhus contracted by infection in his laboratory at Lemberg, where he was working at the invitation of the Polish government.

PREPARATIONS for the fourth Boston meeting of the American Association for the Advancement of Science, to be held from December 26 to 30, by invitation of the Massachusetts Institute of Techonology and Harvard University, are progressing in a very satisfactory way. The privilege of reduced railway rates for those attending the meeting has already been granted by the New England Passenger Association, the Trunk Line Association, the Central Passenger Association, the Southeastern Passenger Association, and the Eastern Canadian Passenger Association. This privilege is based on the certificate plan, and the cost of the round trip to Boston will be one and one half times the regular one-way tariff. The region thus far included extends about to the Mississippi River.

SIGMA DELTA EPSILON, graduate women's scientific fraternity, founded at Cornell University, May, 1921, recently became incorporated and installed Beta Chapter at the University of Wisconsin on April 25. The national officers, who serve until the convention in Boston in December at the time of the meetings of the American Association for the Advancement of Science are: Christianna Smith, Cornell, *president;* Elizabeth Smith, Wisconsin, *first vice-president;* Helen M. Johanns, Wisconsin, *second vice-president;* Evelyn Fernald, Cornell, secretary; Helen Brewster Owens, Cornell, *treasurer.*

DR. VERNON KELLOGG writes: "The industry and commerce committee of the Polish parliament has drafted a bill providing for the adoption of the metric system of weights and measures for the whole of reunited Poland. The bill provides that beginning January 1, 1923, all retail trade in Poland will be conducted on this basis, and that on and after January 1, 1924, all trade, whether retail or wholesale. At present the metric system is in use in the parts of Poland which were formerly under German and Austrian rule, but the Russian system, with its versts and poods, is still being used in former Russian Poland.

Following an unconditional gift of its large collection of books and documents on public health, medical and related subjects to the Surgeon General's Library of Washington, the Prudential Life Insurance Company of America has made a similar, though less extensive, presentation of its books and documents on forestry and agriculture to the library of Yale University.

PROFESSOR ARNOLD PICK, the well-known neurologist at Prague, is about to retire from teaching and wants to sell his library. It contains some 3,000 works on psychiatry, neurology and psychology, besides 7,000 reprints and theses.

THE *British Medical Journal* states that strong protests have been made by the medical profession in France, and especially by the Syndicat général des médecins français électro-radiologistes, against the appointment by the prefect of the department of the Seine of a radiographer who is not a qualified medical practitioner to be director of the radiological laboratory of the Salpêtrière Hospital in succession to the late Dr. Charles Infroit.

MR. F. H. RIDDLE, president of the American Ceramic Society, writes: "Allow me to submit a correction to the item relating to the annual meeting of the American Ceramic Society which appeared in SCIENCE on June 2. As it stands, it is made to appear that in the investigation on special porcelains adapted for spark plugs, etc., conducted by the Bureau of Standards, the work of Mr. A. V. Bleininger was of a secondary and minor character. Permit me to say that his contribution was vital and important and that the final conclusions reached were the result of close cooperation."

A REFLECTING telescope with a 61-inch mirror is to be made for Ohio Wesleyan University. It will be housed in the Perkins Observatory, of which Professor Clifford Crump is director. There are only two reflecting telescopes in the world which will exceed this new instrument in size, according to officials of the Warner and Swasey Company, which has contracted to make the installation. These are the 100-

inch reflector at the Mount Wilson Observatory in California and the 72-inch one at Victoria, British Columbia. The $250,000 for its construction was given by Professor M. H. Perkins, for twenty-five years an instructor in mathematics at Ohio Wesleyan, who has made many other contributions for the upkeep and maintenance of the observatory. A feature of the telescope is that it will be devoted primarily for the use of the students in the university and only secondarily for research. This is the first of the large instruments to be so used. Three years will be required to complete the installation.

A Beta Chapter of Sigma Delta Epsilon, a women's honorary scientific society, was recently installed at the University of Wisconsin. The society has a membership of 33 women who are doing advanced work in science in the University of Wisconsin, the federal government and the state scientific institutions in Madison. The officers are Dr. Eloise Gerry, U. S. Forest Products Laboratory, *president;* Miss Marion E. Phelps, department of physics, *vice-president and chairman of the membership committee;* Miss Helen Johann, cereal investigations U. S. Department of Agriculture, *secretary;* Dr. Elizabeth A. Smith, department of zoology, *treasurer;* and Miss Nevada Evans, department of plant pathology, *chairman of the program committee.* The meetings are held twice a month and give opportunities for presentation and informal discussion of the results of research as well as social intercourse. The society is non-secret. Its name means united in friendship through science. The officers-elect for the coming year are Professor Elizabeth A. Smith, zoology, *president;* Professor Helen Parsons, food chemistry, *vice-president;* Miss Helen Johann, cereal investigations, *secretary;* Miss Ruth Chase, zoology, *treasurer;* and Miss Emma Fiske, botany, *chairman of the program committee.*

The Biological Station of the University of North Dakota at Devil's Lake is planning to continue this season the work which it has been conducting for a number of years past, which includes experiments on the influence of solutions of different salts of varying concentrations upon fishes, in the attempt to ascertain the cause of death of fish in such solutions. It is also continuing the biological survey of the state, upon which considerable progress has already been made. The work this year will be centered, chiefly on the fishes, reptiles and Amphibia. Reports have already been published, or are in press, dealing with a number of groups, including the birds, mollusks, Protozoa, locusts, and bugs (Hemiptera). This latter work is in charge of Miss Crystal Thompson, of the Amherst College Museum, and is in cooperation with the Museum of Zoology at Ann Arbor. The environment of Devil's Lake, with numerous ponds differing markedly in their physical and chemical characteristics, marshes, woodland, and cultivated land, contains a rich fauna for ecological studies, especially on aquatic life.

We learn from *Nature* that the Strangers' Hall, Norwich, an old city merchant's house, with groined undercroft, fifteenth century banqueting hall, and other paneled rooms of later date, has been offered by its owner, Mr. Leonard G. Bolingbroke, to the corporation of Norwich for the purpose of an English Folk and Historical Museum, in conjunction with the Norwich Castle Museum. Mr. Bolingbroke has also offered his collection of old domestic appliances and other "bygones" illustrative of the various phases of a middle-class Englishman's home during the last four or five centuries, which will find a fitting environment in the various rooms of the house. While the aim of the museum will be historical rather than scientific, there will be found many exhibits of interest to students of early history and development of such subjects as the production of light and fire, domestic cookery, and other kindred objects.

The *Royal Geographical Journal* reports that an expedition lately left Copenhagen for the Dutch East Indies with the object of taking preliminary steps towards the establishment of a Tropical Station for Biological Research in that region. It is headed by Dr. T. Mortensen, of the Copenhagen Zoological Museum, and the botanist is Hjalmar Jensen. The project was set on foot some years ago and has been brought to a head through the labors of a Scandinavian Society formed for the pur-

pose. The present expedition has been rendered possible by a grant from the "Raskorsted Fund." The probable site of the station will be in the Ké islands, previous research having shown that there is an unusual abundance of animal life in the waters to the west of the group. What is really a deep-water fauna is here found at comparatively small depths—200-300 meters—making it easy to collect rare deep-water species. It is possible that Dutch cooperation may be secured, and in any case the intention is to give an international character to the station.

UNIVERSITY AND EDUCATIONAL NOTES

MRS. DOROTHY WHITNEY STRAIGHT will give to Cornell University a million-dollar building to be used as a center for the social and recreational life of the students.

AT the commencement of Princeton University a gift of $100,000 was announced from James H. Lockhart, of Pittsburgh, for the endowment of scholarships in memory of his father, Charles Lockhart.

HEARST HALL and Hearst Hall Annex were destroyed and the Pathology Building of the University of California was damaged on June 21 in a fire with estimated loss of $100,000. Hearst Hall, a large frame structure, was the gift to the university women of Mrs. Phoebe Apperson Hearst. Mr. William Randolph Hearst has undertaken to rebuild Hearst Hall and its accessory buildings in fireproof material.

DR. HAVEN EMERSON has been appointed professor of public health and administration in the College of Physicians and Surgeons, Columbia University, and given the task of working out a plan for the organization of the Institute of Public Health established by the bequest of the late Joseph A. DeLamar.

MR. SIGFRED HAUGE and Mr. Robert Evans have been appointed instructors in the division of agricultural biochemistry of the University of Minnesota. Dr. Paul F. Sharp, instructor in the division, has been appointed assistant chemist of the Montana Agricultural Experiment Station.

PROFESSOR S. I. KORNHAUSER, of Denison University, has been appointed head of the department of anatomy of the School of Medicine of the University of Louisville, in the place left vacant by Dr. Chas. Brookover. During the summer Dr. Kornhauser will be biological assistant to Colonel William G. Atwood, director for the committee on marine piling investigations of the National Research Council.

DR. ALFRED POVAH, formerly associate professor of plant pathology and associate plant pathologist at Alabama Polytechnic Institute, has been appointed assistant professor of botany at Northwestern University.

DR. A. O. WEESE, professor of biology at the University of New Mexico for the past ten years, has accepted the professorship of biology at James Millikin University, Decatur, Illinois, recently made vacant by the death of Dr. A. A. Tyler. Professor Weese has spent the past year at the University of Illinois.

DISCUSSION AND CORRESPONDENCE

THE NEW CATASTROPHISM AND ITS DEFENDER

REFERENCE was made in my contribution to SCIENCE for February 17 to Professor Price, alleged geologist, upon whose scientific vagaries a reactionary theology relies much in its recent attack on evolution—the result of a recrudescence of the old conflict which such a theology has ever waged against the progress of science.

George McCready Price, who since 1906 has held positions as professor of geology, College of Medical Evangelists, Loma Linda, California, professor of English literature, Fernando Academy, California, and professor of chemistry and physics, Lodi Academy, California, is evidently in the religious denomination (Seventh Day Adventist) to which he belongs held to be a man of considerable versatility.

The writings by which he is best known are two books, "Fundamentals of Geology" (1913), and "Q. E. D., or New Lights on the Doctrine of Creation" (1917), and numerous articles in the religious press—chiefly the Philadelphia *Sunday School Times*.

The distinctive ideas for which he stands in

geology (the only ones to be reviewed in this article) are:

First: What he terms the "New Catastrophism," which turns out to be nothing more than the Old Catastrophism embodied in the Noachian Deluge.

Second: A literal creation of material things (the sidereal universe with its parts apparently in different stages of development—its nebulæ, hydrogen stars, metallic stars, carbon stars and dark stars); and all animate things (trilobites, nummulites, graptolites, ammonites, sigillaria, the fishes of the Old Red Sandstone, the large reptiles of the Mesozoic, the mammoth and the mastodon, the one-toed horse and the three-toed horse, and man) all at one and the same time just as set forth in the first chapter of Genesis.

While not committing himself to any estimate of the time back of the present when all this took place, it is evident that he leans to a "short chronology"; for in Chapter IX of his Fundamentals of Geology he argues for a catastrophic instead of a uniformitarian rate for the deposition of strata. In Chapter I of his "Q. E. D." he refers to the study of the phenomena of radioactivity as having "thrown a good deal of doubt upon the older estimates of the age of the earth," but he fails to inform his reader that such study has revealed the necessity of postulating a long succession of atomic transformations, and has enormously extended the length of geologic time.

Realizing that if there has been a geological succession of life on the earth

> "then some form of genetic connection between these successive types is the intuitive conclusion of every thinking mind, even though the recovery of these connecting links may prove impossible,"

and his Genesis account, which he is out to defend at all hazards, goes by the board, he flatly denies that there has been any geological succession, and sets himself to the task of endeavoring to prove the astounding thesis "that all fossils are of the same age and none of them older than man." In doing this he shows wide familiarity with geological literature, quoting largely from the most eminent authorities in this country and in Europe. Any one reading these writings of Price, which possess a certain charm of literary style, and indicate on the part of the author a gift of popular presentation which makes one regret that it had not been devoted to more laudable purpose, must constantly marvel at the character of mind of the man who can so go into the literature of the subject and still continue to hold such preposterous opinions.

The position of superiority he arrogates to himself is amazing: With his solicitude for harmonizing his views with those of the Bible so palpable, one of his eyes, at least, being always "kept on Genesis," he still has the face to accuse all "other geologists" of being biased, charging that they hold to a belief in geological succession "solely on the strength of the infallibility of a theory" (elsewhere referred to as the onion-coat theory of Werner) "invented a hundred years ago in a little corner of western Europe."

So much under the spell of this old Wernerian hypothesis are geologists still (excepting himself), that, according to Price they "invent" unconformities and faults to explain breaks and repetitions in the life succession.

Price especially endeavors to find "mare's nests" in the "alleged" great thrust faults of the earth, impugning the competency or integrity, or both, of the distinguished geologists who vouch for their existence: as that of Heim and Rothpletz for the great Glarus overthrust in the Alps, that of Geikie for the great overthrust in Scotland, that of McConnell, Campbell and Willis for the great overthrust along the eastern front of the Rockies in Canada and northwestern United States, and finally that of Hayes for the numerous overthrusts in the southern Appalachians.

Professor Price also thinks he has found another geological "mare's nest," one that ought to confound these believers in a geological succession, in the fact:

> "That the rivers of the world in cutting across the country, completely ignore the varying ages of the rocks in the different parts of their courses, and act precisely as if they began sawing at them all at the same time."

Evidently the conception of a superimposed river, disclosing old buried structures as it deepens its channel, so easily understood by any high school student of physiography, is beyond the mental grasp of the author of "Fundamentals of Geology."

This then is the man who, while a member

of no scientific body and absolutely unknown in scientific circles, has in at least one of his contributions to the religious press (the one in which he tried to make much of the so-called anti-evolution admissions of Bateson) had the effrontery to style himself "geologist," in the expression he there used "we geologists"; and this is the man who in his support of a literal Genesis is hailed by the "Fundamentalists" as their great champion—one who has "demonstrated the absurdity of the evolutionist's geological theories" and has brought into prominence the "heretofore mute evidence of a mighty upheaval and a flood."

ARTHUR M. MILLER
UNIVERSITY OF KENTUCKY

KEYS IN SYSTEMATIC WORK

TO THE EDITOR OF SCIENCE: It seems more mechanical uniformity is possible in the keys which systematists find of so much value in descriptive work. The number of forms used now is limited apparently only by the number of authors publishing such keys, and among this large number of forms are many which are wasteful of space and many which are confusing to the student.

Some of the mechanical requirements of a good key may be briefly summarized:

1. The key should occupy a minimum amount of space, and should present the minimum difficulty to the printer.

2. The key should be capable of indefinite expansion, that is, provide for any number of groups, and no headings of groups or sections should be duplicated.

3. Any desired space under each heading should be available.

4. Coordinate groups in the key should be recognizable as such at a glance and such coordinate groups should be in juxtaposition.

5. The key should be as readily "run backward" as "run forward."

Ample reasons for all these requirements could be given but need not be detailed here. The following skeleton key shows a form which I believe meets all these requirements, and it is presented for criticism in the hope that after discussion some form of key may be found which will meet with general approval. Sections 3 and 3′ show length of printed lines when several lines are required for a section.

KEY TO SPECIES *a-h* OF THE GENUS X

1.	Tarsi spurred	2.
1′.	Tarsi not spurred	5.
2 (1).		*a.*
2′.		3.
3 (2′).		
		4.
3′.		
		b.
4 (3).		*c.*
4′.		*d.*
5 (1′).		*e.*
5′.		6.
6 (5′).		*f.*
6′.		*g.*
6″.		*h.*

E. B. WILLIAMSON
BLUFFTON, INDIANA

THE Y-CHROMOSOME TYPE OF SEX-LINKED INHERITANCE IN MAN

IN a short article which appeared in the *Journal of Heredity* for November, 1921, Richard Schofield describes a case of human inheritance which has very great theoretical interest. It involves the transmission through four generations of a condition called webbed toes. The condition is found only in male members of the family and is transmitted from father to son, never to a daughter nor through a daughter to her sons.

It thus has the distribution in heredity of a Y-chromosome, a structure found only in the male-determining spermatozoa of certain animals and never in their eggs. The Y-chromosome accordingly is a structure possessed by male individuals only and thus forms an appropriate vehicle for the transmission of characters from father to son, quite independently of the female line of descent. All this was pointed out by Schmidt in a contribution from the Carlsberg Laboratory, which I reviewed in SCIENCE for April 8, 1921, under the title "A New Type of Inheritance." Schmidt described in a fish the first known case of inheritance of this type. This has since been confirmed in the case of another species of fish by a Japanese observer, so that it may now be regarded as well established. Schofield's article

furnishes evidence that the Y-chromosome type of inheritance occurs in man as well as in fishes.

W. E. CASTLE

BUSSEY INSTITUTION,
JUNE 3, 1922

THE VOCABULARY OF METABOLISM

I wish to suggest in the columns of SCIENCE the following new terms in the vocabulary of metabolism: (1) *Eubolism,* a condition of normal bodily metabolism; (2) *Pathobolism,* a condition of perverted metabolism of a diseased nature, as, for example, diabetes; (3) *Dysbolism,* a condition of disturbed metabolism not necessarily of a diseased nature, as, for example, alkaptonuria. I believe that these terms will supply a want in the terminology of metabolism.

MAX KAHN

BETH ISRAEL HOSPITAL,
NEW YORK

SALARIES OF PROFESSORS IN POLAND

I TAKE the following item from the weekly news release of June 7 of the Polish Bureau of Information:

Because of the importance attached to their rôle in the life of the nation, the university professors of Poland have been granted salaries greater than those to which their official rank would entitle them. [The official rank of full professors in Polish universities is considered equivalent to that of major generals.]

If they have been in service fifteen years and are supporting families, they are to receive monthly salaries of 139,000 marks. This approximates the salaries of cabinet ministers, who receive about 160,000 marks monthly, and is slightly in excess of those of vice-ministers, who receive, including representation funds, about 137,000 marks.

These salaries for professors have been made possible by a special provision in the state budget, appropriating 357,906,966 marks for professors' salaries and 87,625,761 marks for the salaries of assistants, a total of nearly half a billion marks. [For the value of a Polish mark in American money to-day, consult the morning newspaper.]

VERNON KELLOGG

WASHINGTON, D. C.

SPECIAL ARTICLES

THE SPIRAL TREND OF INTESTINAL MUSCLE FIBERS

IN the *Anatomical Record* for May, 1921 (Vol. 21, pp. 189-215), Professor Carey published his "Studies on the Structure and Function of the Small Intestine." These were reprinted, in part, with the title, "Studies on the Anatomy and Muscular Action of the Small Intestine," as the opening article of volume 1 of the *Journal of Gastro-Enterology* (July, 1921). The first conclusion, and the only one on which comment is here to be made, is this:

> The inner muscle coat of the small intestine is not composed of circular or annular rings contiguously placed, but is a continuous muscular sheet wound into a close helix. One complete turn is made in every 0.5 to 1 mm. or less (*Anat. Rec.*, p. 193; *Journ. Gastro-Ent.*, p. 9).

Professor Carey characterizes the conception that the inner muscular coat is composed of discrete muscular rings with a certain degree of connection, as "a faulty anatomical heirloom"—an "erroneous idea which arose with the inception of the microscope and has since been accepted unchallenged." There is, however, a neglected anatomical heirloom, with which perhaps the author was unfamiliar, in the form of "A Discourse concerning the Spiral, instead of the supposed Annular, structure of the Fibres of the Intestins; discover'd and shewn by the Learn'd and Inquisitive Dr. William Cole to the Royal Society" (*Phil. Trans.*, 1676, Vol. xi, pp. 603-609). This discourse, not now readily accessible, is so admirably confirmed by Professor Carey's repetition of the work as to repay examination.

At the time of Dr. Cole's studies, Willis, in his *Pharmaceutice rationalis,* published two years previously, had described the interior fibers of the muscular coat as "annular, everywhere girdling in close-set ranks the cavity of the intestines, and inserted into the edge of the mesentery as in a tendon." Overlying these, and "crossing them at right angles," he found straight or longitudinal fibers, and believed that the sinewy outer layer wrapped around them served them in place of tendons. (Earnest efforts were made by the early anatomists to

find tendons for smooth muscle!) From the mesentery and from the fibers of the outer coat, the circular and longitudinal muscles, respectively, received the animal spirits or nervous energy whereby they were at first inflated and distended, thereafter becoming shorter and more contracted. As to the action of the two sets of muscle fibers, he wrote:

> Indeed the circular fibers, having contracted successively and seriatim, constrict the diameter of the intestine; and at the same time the longitudinals, inflated and distended, narrow it still more and produce a downward movement, so that the contents of the intestines, thus compressed from behind, must constantly be driven forward.

With such a description current, Dr. Cole begins his paper as follows:

> Discoursing (near two years since) with a very ingenious Person, concerning the Mechanical reason of the Peristaltick motion of the Intestines, which is by Anatomists deduced principally from *Annular* fibres, constituting, according to the received doctrine (with the right fibres immediately investing them, though, by the by, I take these to make a distinct coat) one of the coats of them; his sence was (which he told me was that likewise of some others of his acquaintance) that they might be rather numerous, though small, Sphincter-muscles, than single fibres, to which that motion is to be attributed.

For four theoretical considerations Dr. Cole dissented, namely (1) that on the supposition of circular sphincters there would be no continuous lengthwise channel for the propagation of motion, and (2) lateral transmission seems not to be agreeable to nature's methods. Moreover, (3) lateral exits would tend to prevent distension of the fibers by the influent matter; and (4) circular muscles lack two tendons by the approximation of which all muscular work is accomplished. He therefore offered the following solution:

> *Viz.* That those fibres which have been esteemed *annular*, might perhaps be *spiral*, and so be continued down in one tract to the lowest extremity of the intestines; . . . their declination being not easily discernible. . . But . . . I consider'd 'twas too unphilosophical to acquiesce in bare speculation, when *autopsy* might be consulted; and therefore I set upon the experiment, first in the upper intestines of an Ox, afterwards in those of Sheep and Calves. . . .
>
> To effect a due disjunction of the membranes and fibres (which I found 'twas hard, if not impossible, for me to make while 'twas raw), I was fain to cause the intestine of Oxen to be boiled 5 or 6 hours, of Sheep 4; whereby the compages of the parts was so loosned, that the two outward coats were easily separated from that to which my search was destined, and left those reputed annular fibres naked.

The results of attempting to follow, through separation, the course of the bundles of these muscle fibers—single fibers being found too small to isolate—Dr. Cole records in numbered paragraphs, from first through "eighthly." The following are selected statements, abbreviated (as were previous citations):

> When, beginning at the top, I attempted the separation of one of these clusters of fibres towards my right hand (on that side of the intestine, I mean, which was turned towards me) a whole ring would come off together . . .; but endeavouring it towards my left, I found, for the most part, I could easily enough unravel that cluster to a considerable length, *viz.*, that of sometimes more than two or three spans, before ruption, which yet at last 'twould be subject to.
>
> If I began at the lower part of the intestine, and try'd to unravel *upwards*, there was not much more difficulty in so doing . . . [But] the operation, I observ'd would not succeed, unless I attempted it on the contrary order, *viz.*, towards my right hand.
>
> When before boiling I caused the inside of the intestines to be turned outward, as I did in two tryals, . . . and endeavoured to unravel the fibres, I found they would come off in the contrary order . . . the intestine being inverted, the order of separation must be so too.

Other observations are that the obliquity of the spiral may vary; that the spiral is less well-defined in the cæcum; and that everywhere some fibers deviate from the main trend, being in the opposite order, or forming intercommunications between the turns of the spiral. But the general conclusion reached is that the fibers altogether form "one concave helical muscle."

> Where the tendons of it are fixed is not evident; but if I may have the liberty of conjecture, I should think the upper of them to be radicated at the pylorus (if not as high as the sphincter gulæ); and the other at the anus.
>
> Whether the supposed annual fibres of the veins

and arteries may not have the same fabrick as those of the Intestines . . . I propose to be considered and examined by persons of more acute hands and judgment; as I do all what I have here delivered, nor daring too much to trust even the informations of my own hands and eyes, till I find them confirmed by those of others, more judicious as well as more dextrous in making experiments.

After two centuries Professor Carey has supplied the needed confirmation *except in one particular;* he finds that the spiral winds in the opposite direction! Carey describes a "left-handed helix,"—a spiral which reverses the direction of the rotation of the embryonic stomach and goes counter to the twisting of the œsophagus. But Dr. Cole recorded the type familiar in dextral gastropod shells, which accords with the rotation of the stomach. Although it often happens in nature, as noted by Thompson, that two opposite systems of geodetic spirals exist together, and interfere with one another, forming a criss-cross pattern[1] (and indeed such a condition has been recorded for the œsophageal muscles of ruminants[2]), it can not be invoked to reconcile the conflicting statements regarding the direction of the intestinal spiral, since both Cole and Carey agree that there is but one well-defined cleavage. Under these circumstances, the question has been referred to Professor Sykes, who, during the past season, while studying in the Harvard Laboratory, has frequently unwound the circular muscle of the intestine. Although his results are to be published elsewhere, I am permitted to report that he has verified the early work of Dr. Cole in regard to the direction assumed by the spiral; it is dextral. If this is so, Dr. Carey's explanation of that primary torsion of the embryonic intestine which determines the disposition of small and large bowels in the adult, though very ingenious, must be considered illusory, for it depends on sinistral coiling and tension.[3]

The origin of the spiral trend of the muscles is ascribed by Dr. Carey to "the rotating spiral growth of the epithelial cells,"[4] but this is a phase of the problem which invites further study.

Frederic T. Lewis
Harvard Medical School

NEARCTIC PROTURANS

The Protura—the most primitive of all the insects, if indeed they are insects—were first reported from the Nearctic Region in 1909. In that year the eminent Italian zoologist and entomologist, F. Silvestri, collected and described under the name of *Eosentomon wheeleri,* a single species from New York. For the next twelve years no record was added from the vast area of the Nearctic.

The second record from this region was obtained in 1921 from the vicinity of Washington, D. C., the first specimen being found by H. S. Barber, who accidentally came across it in some leaf mold in which he was rearing beetle larvæ. Other specimens of the same species, which proved to be new, were soon taken, and the species described by the writer as *Acerentulus barberi.*[1]

Following the initial discovery at Washington the writer has been fortunate enough to encounter Proturans in large numbers and in considerable diversity at Takoma Park, Maryland. Here during the spring of 1921 no less than twelve species, representing six genera, were found, ten of them proving to be new. These have been described in a paper presented at a meeting of the Entomological Society of Washington.[2]

To these records obtained in the vicinity of Washington are now added several more from widely separated localities, and in some instances from different life zones of the Nearctic Region. These localities are as follows: Chesapeake Beach, Md.; top of Blue Ridge Mountains, near Bluemont, Va. (elevation 1,200 feet); near Prospect Hill, Va.;

[1] *Growth and Form,* 1917, p. 489.

[2] Owen: *Comp. Anat. of Vert.,* 1868, Vol. 3, p. 470.

[3] *Journ. Gen. Physiol.,* 1920, Vol. 3, p. 76 *et seq.*

[4] *Anat. Rec.,* 1920, Vol. 19, p. 220.

[1] "A Second Nearctic Species of Protura, *Acerentulus barberi,* new species." *Ent. News,* Vol. XXXII, pp. 239-241.

[2] "New Genera and Species of Protura," *Proc. Ent. Soc. Wash.,* Vol. XXIII, No. 9, pp. 193-202, Pl. XVI.

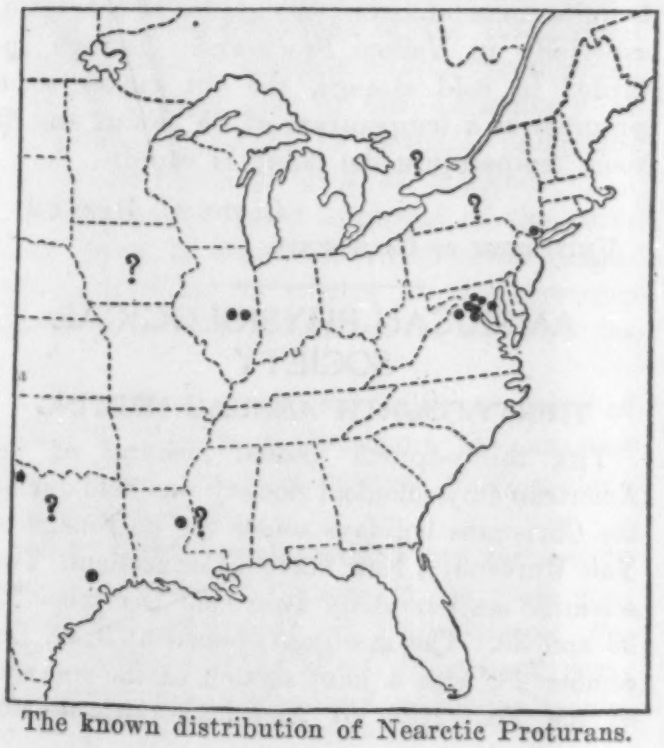
Great Falls, Va.; Tallulah, La.; Houston, Tex.; Chesterville, Ill.; near Decatur, Ill.

Proturans have been searched for but not found in the following localities: Vicksburg, Miss.; Dallas, Tex.; Ames, Ia.; Toronto, Can. In addition, also, Professor Silvestri has looked for them at Ithaca, N. Y., without finding any.

The known distribution up to date of Proturans in the Nearctic is shown by the accompanying figure, each positive record being indicated by a large dot and each negative record by a question mark.

It would be premature at this time to attempt any generalizations in regard to the Nearctic distribution of these most primitive hexapods, yet by way of summary it may be noted that up to the present Proturans have been found in 9 localities in the Upper Austral Life Zone, these records coming from 4 different states; from 2 localities in the Lower Austral Life Zone, the records being from different states; from 1 locality in the Transition Life Zone. Of the negative records, 1 is from the Upper Austral, 2 from the Lower Austral and 2 from the Transition.

The only life zone in which these hexapods have been found in either abundance or diversity is the Upper Austral. In the Lower Austral only two minute under-bark species were taken—two specimens of *Eosentomon pallidum* Ewing from Tallulah, La., and two specimens of *Eosentomon minimum* Ewing from Houston, Tex. In the Transition, three specimens of *Eosentomon wheeleri* Silvestri and one specimen of *Eosentomon pallidum* Ewing were taken from decaying leaves and twigs near Bluemont, Va., at the top of the Blue Ridge Mountains (elevation 1,200 feet).



The known distribution of Nearctic Proturans.

H. E. EWING

U. S. NATIONAL MUSEUM

STEM END ROT OF APPLES

DURING the late spring of 1921 a large number of apples were found which developed a decay at and around the base of the stems. These apples were in a lot that had been removed from a cold storage temperature of 32° and held for a few days at 45° Fahr. When placed in moist chambers such apples very soon decayed without wrinkling, becoming soft and watery. The decay was of a sharply defined nature, such that the affected parts could be easily removed. Normally these decayed apples were soon covered with green mold. On examining the stems of apples in storage it was found that many stems were green with spores. Cultures of this mold were made by the poured plate method. The fungus was believed to be *Penicillium expansum* Link., and was later identified as such by Mr. Charles Thom of the U. S. D. A., Bureau of Chemistry.

A search of the literature on apple decay was made, but no mention of the entrance of a decay-producing organism through the stem was noted. The decay of apples ordinarily caused by *P. expansum* is invariably mentioned in connection with abrasions of the skin, such as insect punctures, wounds or injuries of a mechanical nature. Some writers mentioned the infection as entering through the calyx or blossom end but no one noted stem end infection.

The matter was taken up with Mr. E. A. Siegler, assistant pathologist of the U. S. D. A., Bureau of Plant Industry; Mr. Charles Brooks, pathologist, and Dr. Charles Thom, mycologist, U. S. D. A., Bureau of Chemistry, none of whom had noted such a decay gaining access to the apple by way of the stem. In fact they

doubted the possibility of any fungus traversing the dry stem of an apple. It is well proven that stem end rots occur in other fruits, for example, the stem-end rot of citrus caused by *Phomopsis* sp. and the stem-end rot of both citrus and watermelon caused by two species of *Diplodia*.

In the fall of 1921, large, mature Yellow Bellefleur apples were secured from trees in a Berkeley garden. These apples were picked with the fruit spurs attached, carefully washed in wood alcohol, mercuric chloride solution 1-1000 and distilled water consecutively. The leaves were clipped from the spurs to facilitate the work but the spurs were not removed. Moist chambers were sterilized, lined with filter paper, washed out with mercuric chloride solution, rinsed with distilled water, glass covers were prepared in the same manner. The spurs were then removed from each apple in turn and spores of *P. expansum* from sub-cultures made from the original isolation were planted on the freshly exposed surface at the ends of the apple stems, and the apples placed in the moist chambers. Control apples similarly treated but not inoculated were placed in jars prepared in the same manner and all were kept under the same conditions in the laboratory. Of the six apples treated in this manner, four developed the characteristic stem end rot and were soon completely decayed. The check apples kept in good condition for three months.

Yellow Newtown apples were picked in the same manner at Watsonville, California, and brought to Berkeley. On October 17, 1921, three of the ripest of these apples were treated and inoculated in the same manner as the Bellefleurs. On November 18 the decay of all three apples was identical with the decay observed on the fruits naturally infected. Six Yellow Newtown apples were treated in the same manner and inoculated with the same organism several days later than the previous group and they all developed the typical decay. In all cases the checks remained in good condition. At the end of six weeks, all the apples so inoculated were entirely decayed and covered with green spores.

Cultures of the spores appearing on the surface of the inoculated apples were made and appeared identical in every way with the original culture. Stab inoculations were made with these re-isolated cultures on apples also carefully sterilized. At the same time other apples were inoculated with the original culture. The results were identical, the typical Penicillium decay of apples resulting at every puncture. A penicillium isolated during the fall of 1921 from decaying prunes was found to cause typical decay of apples when inoculated into the flesh. This prune penicillium was planted on three Yellow Newtown apple stems and within three weeks it caused typical stem end decay of all three apples. This organism was later found to be identical in all of its reactions with the original penicillium isolated from apples.

Washings made from the attached leaves on some of the apples used in the experiments were plated and typical colonies of *P. expansum* appeared on all the plates so made. About 15 per cent. of the colonies which grew were identified as some species of Penicillium, a considerable number of which caused typical *P. expansum* decay when inoculated into mature apples. This would indicate the prevalence of the organism in the trees at the time of harvest.

These results prove that stem end infection of apples is a possibility. Observations by the writer indicate that this mode of infection is quite common among the apples of this state, especially in Yellow Newtowns. Though retarded in cold storage, the rot makes some progress at a temperature of 45° Fahr. and at room temperature the decay is rapid.

Clyde C. Barnum
University of California,

AMERICAN PHYSIOLOGICAL SOCIETY

THIRTY-FOURTH ANNUAL MEETING

The thirty-fourth annual meeting of the American Physiological Society was held during the Christmas holidays under the patronage of Yale University, New Haven, Connecticut. Two scientific sessions daily were held December 28, 29 and 30. The meetings opened at 9:30, December 28, with a joint session of the societies of the Federation of American Societies for

Experimental Biology, under the chairmanship of J. J. R. Macleod of the physiologists. A vigorous program of reports on the scientific subjects announced below was carried out in the six half-day sessions.

The afternoon of December 29 a joint demonstration was held in the halls of the Osborne Zoological Laboratory. The demonstrations of the American Association of Anatomists occurred at the same time. This brought the two great groups of scientists of the pre-medical sciences together in what proved to be a very pleasing and outstanding demonstration of scientific progress for the year.

Three business sessions were carried forward at which the more important steps and decisions made were as follows:

1. The report of the treasurer, Dr. Joseph Erlanger, of Washington University School of Medicine, showed a net balance of $467.07.

2. The annual assessment was placed at one dollar per member.

3. An appropriation of $125 was made in aid of the English journal, *Physiological Abstracts.*

4. The council announced the appointment of J. Hepburn of the University of Toronto to the fellowship established at the last annual meeting under the grant of Dr. W. T. Porter. Dr. Hepburn is pursuing his research in the subject of 'The Reactions of the Respiration Center to Lack of Oxygen." This investigation is being carried out in the Laboratory of Physiology, University of Toronto, under the direction of Professor J. J. R. Macleod.

5. The society voted approval of the principles stated in the Cannon-Henderson resolution, instructing its officers of the executive committee of the federaiton to support the same.

6. The council announced the appointment of Donald R. Hooker of Baltimore as managing editor of the *American Journal of Physiology* for the year 1922.

7. The council recommended and the society voted the following changes in the rules governing the publication of *Physiological Reviews.* These changes affect the general management of the journal by reserving to the council the appointment of the chairman of the editorial board, and by transferring the appointment of the managing editor to the editorial board.

8. The report of the managing editor of the *American Journal of Physiology* to the council which was transmitted to the society showed a progressive recovery from the war time deficit in the issue of the successive volumes of the journal. At the present time the cost of publication per volume is only slightly greater than the income for the same. The net balance in the journal fund is $9,659.62.

The council announced that in order to overcome the delay in publication a free volume of the journal would be issued immediately, and beginning with the next current volume the size of the journal would be restored to the standard of 600 pages.

9. The first issue of the first volume of *Physiological Reviews* was announced together with the encouraging report that subscriptions had so far exceeded anticipation that reprinting of the first number had already been accomplished.

The following board of editors for *Physiological Reviews* for the year 1922 was reported by the council:

William H. Howell, Baltimore, *chairman;* J. J. R. Macleod, Toronto; D. R. Hooker, Baltimore; Reid Hunt, Boston; Frederic S. Lee, New York; L. B. Mendel, New Haven; H. Gideon Wells, Chicago.

10. The following officers of the society were elected at the business meeting on December 29:

J. J. R. Macleod, University of Toronto, *president;* C. W. Greene, University of Missouri, *secretary;* Joseph Erlanger, Washington University, *treasurer;* J. A. E. Eyster, University of Wisconsin, member of the council for the years 1922-25.

11. The following scientists were elected to membership during the session:

Edward Frederick Adolph, A.B., PhD., instructor in general physiology, University of Pittsburgh.

James Percy Baumberger, B.S., M.S., Sc.D., instructor in physiology, Leland Stanford Junior University.

Henry Cuthbert Bazett, M.A., M.D., F.R.C.S. (Eng.), professor of physiology, University of Pennsylvania.

G. E. Burget, B.S., Ph.D., professor of physiology, University of Oregon.

Mary Elizabeth Collett, A.B., A.M., Ph.D., instructor in physiology, University of Buffalo.

Helen Copeland Coombs, A.B., Ph.D., instructor in physiology, Columbia University.

D. J. Edwards, Ph.D., assistant professor of physiology, Cornell Medical College.

Carl Hartley Greene, A.B., Ph.D., M.D., assistant in medicine, Mayo Foundation.

Carl G. Hartman, A.B., A.M., Ph.D., professor of zoology, University of Texas.

Henry F. Helmholz, A.B., M.D., professor of pediatrics, Mayo Foundation.

Paul Dudley Lamson, A.B., M.D., associate professor of pharmacology, Johns Hopkins University.

Carl H. Lenhart, Ph.B., M.D., associate in surgery, Western Reserve University.

Clarence A. Mills, A.B., Ph.D., instructor in bio-chemistry, University of Cincinnati.

Stuart Mudd, B.S., A.M., M.D., fellow in medical research, Harvard Medical School.

Harry Sidney Newcomer, A.B., A.M., M.D., research assistant, Henry Phipps Institute.

Leonard B. Nice, Ph.D., professor of physiology, University of Oklahoma.

Stanley P. Reimann, M.D., assistant in experimental pathology, University of Pennsylvania.

Mrs. Mary Davis Schwartz Rose, A.B., Ph.D., associate professor of nutrition, Teachers College, Columbia University.

Clarence A. Smith, B.S., M.S., Ph.D., associate in physiological chemistry, Jefferson Medical College.

Joseph Treloar Wearn, B.S., M.D., instructor in pharmacology, University of Pennsylvania.

Russell M. Wilder, B.S., Ph.D., M.D., assistant professor of medicine, Mayo Foundation.

At the close of the last general session the appreciation of the society for the material facilities and social arrangements of the local committee was expressed in the following resolution:

The American Physiological Society wishes to express its sincere thanks to the Yale University and to the local committee for the splendid facilities offered for the scientific meetings, and for the cordial hospitality extended to members attending the meetings.

SCIENTIFIC SESSIONS

The scientific sessions of the annual meeting were of high merit throughout. Perhaps the most profitable feature of the meeting was the vigorous discussion which characterized a large majority of the subjects presented. Too many themes were introduced for the time available, thus crowding the program. It was evident that more restriction would have to be used if representative reports of the activities of American physiologists are to be discussed within the limit of a three days session. The entire list of titles reported at the meeting or announced in the printed program is as follows:

The effect of thyroidectomy on heat production following injury to the suprarenal cortex in rabbits: David Marine and Emil J. Baumann.

Metabolism studies with enemata of dextrose and levulose: Thorne M. Carpenter.

Reasons for believing that respiratory X is not Ch: Yandell Henderson.

Does the partial pressure of oxygen in arterial blood during progressive anoxemia support the secretary theory? C. W. Green and Carl H. Greene.

Determination of the acid base balance of the blood: Donald D. VanSlyke.

The acid base equilibrium in the blood after parathyroidectomy: D. Dwight Wilson and C. L. Krantz.

Carbon dioxide as an inhibitent of cell growth: G. H. A. Clowes and Homer W. Smith.

Injury, recovery and death. Lantern: W. J. V. Osterhout.

Elective localization of bacteria following various methods of inoculation and the production of nephritis by devitalization and infection of teeth in dogs: E. C. Rosenow and J. G. Meisser.

A new factor in drug analgesia: H. G. Barbour and D. S. Lewis.

On the physiological cause of evolution: Albert P. Mathews.

Integumentary changes in the sheep following thyroidectomy and administration of thyroxin: Sutherland Simpson.

The blood-flow and oxygen metabolism of the thyroid gland: F. P. Knowlton, M. S. Dooley and A. N. Curtiss.

Results on an enlarged thyroid gland nine years after obstructing the veins: C. C. Guthrie.

The after effects of prolonged fasting on the basal metabolic rate (man, dog): Margaret M. Kunde.

Studies on the relation between nutrition and ovulation: an invariable and characteristic disturbance of the œstrous cycle of the rat as a result

of fat vitamine. A deficiency which may nevertheless give normal growth: Herbert N. Evans and Katherine Scott Bishop.

The oxygen capacity of bird's blood: Theodore Kruse.

The reflex control of the lower esophagus and cardia: A. J. Carlson, J. F. Pearcy and E. T. Boyd.

A comparison of the respiratory and circulatory effects of anoxemia and carbon dioxide: E. C. Schneider.

Effects of carbon dioxide on protoplasmic viscosity: M. H. Jacobs.

Water intoxication: L. G. Rowntree.

Blood volume changes in dogs following water deprivation: N. M. Keith.

Some factors modifying the ejection and filling curves of the ventricles under different circulatory conditions: C. J. Wiggers and L. N. Katz.

Physiological aspects of experiments on mitral regurgitation: H. Feil and C. J. Wiggers.

The thermocardiogram, and the relation of its waves to the events of muscle contractions: C. D. Snyder.

The specificity of gastrin and secretin: A. B. Luckhardt, S. C. Heine and W. L. Palmer.

The penetration of dyes into living cells: Marian Irwin and W. J. V. Osterhaut.

Electrical conductivity of animal tissues under normal and pathological conditions: George W. Crile, Helen H. Hosmer and Amy F. Rowland.

The relation of the ammonia content of the blood in Eck's-fistula dogs to meat poisoning: S. A. Matthews.

The hepatic factor in choloroform and phosphorus poisoning: C. S. Williamson.

The excretion of water, chlorides and urea by the human kidneys: E. F. Adolph.

The Glomerular circulation in the frog's kidney: A. N. Richards and Carl F. Schmidt.

Observations on the composition of glomerular urine: Joseph T. Wearn.

The inhibition of erection by decerebration: E. G. Martin and M. L. Tainter.

Changes in osmotic pressure in crabs during the molt-cycle: J. M. D. Olmsted and J. P. Baumberger.

The relative stimulating effect of light of different wave-lengths in an equal energy spectrum: Henry Laurens.

An experimental criticism of the pignet formula for physical efficiency: E. G. Martin, H. S. Wells and A. H. Beede.

The relation of the adrenals to fatigue: F. A. Hartman.

The calorigenic action of adrenalin in dogs: W. M. Boothby and I. Sandiford.

Hibernation: John Tait.

The effect of cocaine on growth of lupinus alba: a contribution to comparative pharmacology of animal and plant tissues: David I. Macht and Marguerite Livingston.

The production of CO_2 by the smooth muscle of sea-anemones: G. H. Parker.

The rôle of the sodium ions in the contraction of the isolated duodenal segment of the albino rat by sodium carbonate: F. S. Hammett and J. E. Nowrey, Jr.

The central heat regulating mechanism: H. G. Barbour and E. Tolstoi.

Physical fatigue and susceptibility—an experimental study: Reynold A. Spaeth and Ella Hutzler Oppenheimer.

The effect of some salts on the growth and experimental amœbocyte tissue near the iso-electric point and after addition of acid and alkali: Leo Loeb and K. C. Blanchard.

On the increased weight of spermatazoa in egg-secretion: O. C. Glaser.

The effects of Roentgen rays upon glandular activity. I. The submaxillary gland: A. C. Ivy, B. H. Orndoff and A. Jacoby.

The applicability of the gasometer method for the determination of the heat production in dogs with and without urethane: W. M. Boothby and F. C. Mann.

Relation between number of hours of sleep and muscular efficiency: Lillian M. Moore, Lu Marie Jenkins and J. Lucile Barker.

Variations in muscular efficiency in women: Lillian M. Moore and J. Lucile Barker.

The regulation of respiration: F. H. Scott, C. C. Gault and R. Kennedy.

The effect of pulmonary congestion in lung ventilation: Cecil K. Drinker, Francis W. Peabody and Hermann L. Blumgart.

Voluntary stimulation of the thoracic autonomic nervous system: N. B. Taylor.

Some relations of vagus and spinal afferent nerves in respiratory control: F. H. Pike and Helen C. Coombs.

Observations on cerebellar stimulations: F. R. Miller.

The possibility of the application to physiology of an inertialess method of observing currents of short duration: H. S. Gasser and J. Erlanger.

The electrical resistance and reactance of suspended unicellular organisms: S. C. Brooks.

Pseudo-paradoxical pupil-dilatation following afferent path lesions: Joseph Byrne.

The catalase content of normal and atrophied muscles: A. E. Guenther and S. Morgulis.

The mode of action of physical work, cold weather and cold baths in increasing the oxidative processes: W. E. Burge.

An experimental study on the significance of fertilization in spathidium spathula: L. L. Woodruff and Hope Spencer.

The relative alcohol content of blood and urine: W. R. Miles.

What are viscera? C. Judson Herrick.

A further study of the effect of total removal of the liver: F. C. Mann and T. B. Magath.

The beneficial influence of certain pancreatic extracts on pancreatic diabetes: J. J. R. Macleod, F. C. Banting and C. H. Best.

A comparison of normal cats and cats deprived of the greater part of the adrenals, with special reference to their reactions to morphine (hyperthermia, hyperglcemia) and to muscular exercise: G. N. Stewart and J. M. Rogoff.

The cardio-accelerator agent produced by hepatic stimulation: W. B. Cannon and F. R. Griffith.

Latent period in reciprocal innervation: J. M. D. Olmsted and W. P. Warner.

Physiological entities in inheritance and evolution: Ernest L. Scott.

DEMONSTRATIONS

A radial transmission sphygmograph with rigid support: C. J. Wiggers and W. R. Baker.

A model demonstrating the dynamics of mitral regurgitation: C. J. Wiggers and H. Feil.

The distribution of the vagus nerves to the sino-auricular junction of the mammalian heart, photographs and tracings: G. Bachman.

The glomerular circulation in the frog's kidney: A. N. Richards and Carl F. Schmidt.

NH_3 production in the nerve during passage of the nerve impulse: Shiro Tashiro.

A simple method of demonstrating glomerular and tubule secreting functions: E. G. Martin and G. D. Shafer.

A new type of recording spirometer: R. Burton-Opitz.

Liver, spleen and bone-marrow of rats treated with germanius dioxide: F. S. Hammett and J. E. Nowrey, Jr.

A two-wedge colorimeter for the comparison of solutions containing two colors, as in the colorimetric determination of the hydrion concentration: Victor C. Myers.

Some new apparatus: D. E. Jackson and J. V. Lawrence.

The effects of parathyroidectomy on the incisors of the albino rat: F. S. Hammett.

PAPERS READ BY TITLE

Vascular reaction to epinephrin in perfusates of various Ch. II. The portal systems of the terrapin: C. D. Snyder and Louis E. Martin.

Source of the water of hemodilution evoked by hot environments: H. G. Barbour, W. J. Craig and E. C. Wakeman.

A study of blood platelets: Theo. Kruse.

A study of alimentary glycemia curves in rabbits: Ernest L. Scott and T. H. Ford.

The contour of the pressure variations in the portal vein: D. D. Forward and H. Feil.

A study of fibrinogen following removal of the the liver: C. S. Williamson, F. J. Heck and F. C. Mann.

A comparison of the different methods of ablation of the liver: F. C. Mann and T. B. Magath.

The production of chronic liver insufficiency: F. C. Mann and T. B. Magath.

The effect of total removal of the liver in some lower vertebrates: T. B. Magath and F. C. Mann.

Smooth muscle responses when subjected to alcohols: F. M. Baldwin and B. M. Harrison.

Pulse rate and blood pressure responses of men to passive postural changes. II. Under low oxygen: Max M. Ellis.

The effect of prostatectomy on integration of muscular movements in the white rat: D. I. Macht and J. L. Ulrich.

The relation of parathyroid tetany to the intestinal flora: Lester R. Dragstedt.

The influence of a beri-beri diet upon the metabolic rate of the white rat: Addison Gulick.

The rôle of the vagi on gastric tonus and motility in the necturus: T. L. Patterson.

The hormone of the posterior lobe of the pituitary gland; its probable nature and its great physiological activity as compared with that of B-iminazolylethylamine: John J. Abel, Charles A. Rouiller and J. S. Vander Lingen.

NH_3 production during muscular contraction: Shiro Tashiro and Olive Pearl Lee.

Observations on the relation of endocrine disorder to early embryonic death in birds: Oscar Riddle and E. R. Rose.

The rôle of the change in hydrogen-ion concentration in the motor activities of the small intestine: Frederick S. Hammett.

Photo reaction currents of the optic nerve: W. T. Bovie.

CHAS. W. GREENE,
Secretary

BOOKS ON OIL

Published by Wiley

Just Out!

DAY'S HANDBOOK OF THE PETROLEUM INDUSTRY

By DAVID T. DAY, Ph. D., Editor-in-Chief, and a Staff of Sixteen of the Country's Foremost Experts in the Field of Petroleum.

This book is, without a doubt, the most comprehensive treatise on Petroleum ever written, covering every phase of the subject. The scattered facts have been ably collated into a series of chapters presenting modern practice only—both for reference purposes and textbook use. Everything is **right up to the minute, practical, and authoritative.**

In 2 volumes—2070 pages, 6 by 9, profusely illustrated, flexibly bound, $15.00 postpaid.

ECONOMICS OF PETROLEUM

By JOSEPH E. POGUE, Consulting Engineer

A book of live interest to everyone in anyway connected with oil. A vast number of helpful facts are presented, and many charts are included, giving at a glance accurate figures and facts dealing with production, costs, etc.

375 pages, 6 by 9, 151 figures, cloth, $6.00.

PROSPECTING FOR OIL AND GAS

By L. S. PANYITY, Oil and Gas Geologist

Describes the various tools and methods of the present-day scientific oil and gas prospector.

249 pages, 6 by 9, 128 figures, cloth, $3.25 postpaid.

PRINCIPLES OF OIL AND GAS PRODUCTION

By ROSWELL H. JOHNSON and L. G. HUNTLEY

A general treatise with reference to American conditions.

371 pages, 6 by 9, 148 figures, cloth, $4.50.

BUSINESS OF OIL PRODUCTION

By ROSWELL H. JOHNSON, L. G. HUNTLEY, and R. E. SOMERS, all of the University of Pittsburgh

This book describes the principles of company organization, as regards scope, personnel and methods. Chapters on Federal taxation, and the legal questions involved in leasing public and Indian lands in this country, and also the acquiring of oil rights in foreign countries, are included.

(In Press. Ready August.)

FIELD MAPPING FOR THE OIL GEOLOGIST

By C. A. WARNER, Field Geologist

A handbook of field methods of value to those geologists who have had little experience with the methods commonly used in examining a territory not yet drilled.

143 pages, 4¼ by 7, 38 figures, flexible, $2.50.

POPULAR OIL GEOLOGY

By VICTOR ZIEGLER, Consulting Geologist

Presents the fundamentals of oil geology in simple language.

171 pages, 5 by 7¼, 62 figures, flexible, $3.00.

Ask us to send you copies of these books on Free Examination

JOHN WILEY & SONS, Inc.

432 Fourth Avenue New York

An Outstanding New Publication

PETERS'
Applied Chemistry

By **Fredus N. Peters, Ph.D.**, Instructor in Chemistry in Central High School, Kansas City, Mo., for twenty-three years; more recently Vice-Principal; Author of "Chemistry for Nurses," etc.

461 pages, 5½ x 7½, with 72 illustrations. Price, cloth, $3.50.

This is an elementary text book for secondary schools and for those who desire an up-to-date work that will meet their everyday needs. Just from the press.

In his preface the author says: "Permit me to say that to me it has never seemed necessary for a high school chemistry to present a mere skeleton of the most interesting of sciences when that skeleton may just as easily be clothed with wonderful symmetry and charming beauty. On the contrary, it has always seemed that a text for secondary schools may and ought to be a readable book just as well as one merely surfeited with facts. . . . Such is the attempt of this text, to present the chemical facts of everyday life in a readable form and by so doing make them interesting."

The author's extensive experience as a writer and lecturer on chemistry eminently fits him to prepare a book especially suited to the needs of elementary colleges. Teachers are requested to write us.

Table of Contents:

1. A Study of Matter.
2. Water and Hydrogen Peroxide.
3. Oxygen and Ozone.
4. Hydrogen.
5. The Atmosphere.
6. Gases and Some Gas Laws.
7. Symbols and Formulas.
8. Some Chemical Problems.
9. The Halogens.
10. Acids and Bases.
11. Nitrogen and Compounds.
12. Carbon.
13. Valence.
14. Illuminating and Fuel Gases.
15. Flame.
16. Methods of Lighting.
17. Some Organic Compounds.
18. Ethereal Salts, Oils, Fats, Sugars.
19. Foods and Their Body Values.
20. Solution and Ionization.
21. Sulphur and Compounds.
22. Periodic Classification of Elements.
23. The Nitrogen Family.
24. Compounds of Silicon.
25. The Alkali Metals.
26. Some Leavening Agents.
27. The Calcium Family.
28. Hard Waters—Methods of Softening.
29. Cleaning and Polishing.
30. The Copper Group.
31. The Magnesium Family.
32. The Aluminum Family.
33. The Lead Family.
34. The Chromium Family.
35. Manganese and Compounds.
36. The Iron Group.
37. The Platinum and Palladium Groups.
38. Reference Tables and Glossary.

C. V. Mosby Co., St. Louis, Mo. (Science)
Please send me a copy of PETERS' APPLIED CHEMISTRY, for which I enclose $3.50.

NAME .....

.....

C. V. MOSBY COMPANY, Publishers

Publishers of Medical, Dental. Pharmaceutical, Nursing, and Scientific Books.

508 N. Grand Blvd. St. Louis

Some New Scientific Books From

THE CAMBRIDGE UNIVERSITY PRESS, ENGLAND

BASIC SLAGS AND ROCK PHOSPHATES

By George Scott Robinson

Results of field experiments with rock phosphates and open hearth basic slags conducted in Essex, 1915-1920. Ill. $4.50

WEATHER PREDICTIONS

By Numerical Process

By Lewis F. Richardson

Presents a scheme of weather prediction founded upon the different equations and not upon partial recurrence of phenomena in their ensemble. With frontispiece. $10.00

THE DYNAMICAL THEORY OF GASES

By H. H. Jeans *Third Edition*

A surpassingly clear and accurate volume of this branch of physics with an extremely valuable chapter on the Quantum Theory. $10.00

TIDES AND TIDAL STREAMS

By H. D. Warburg

A manual compiled for seamen explaining how the height of the tide may be accurately calculated at any port in the world at any moment. Ill. $2.75

PRINCIPLES OF GEOMETRY

By H. F. Baker

Simple relations of position, for points, lines and planes, set in an ordered framework of deduction comprehensible enough to include subsequent theory. $4.00

SPACE, TIME AND GRAVITATION

An outline of the General Relativity Theory (Second Impression)

By A. S. Eddington

A non-mathematical interpretation of Einstein's Theory of Relativity. $5.00

Sold By

THE MACMILLAN COMPANY, American Agents

64-66 Fifth Avenue, New York
Prairie Avenue and 25th St., Chicago
Huntington Chambers, Copley Sq., Boston
609 Mission Street, San Francisco
330 South Harwood Street, Dallas
Hurt Building, Atlanta

ISIS

International Review devoted to the History of Science and Civilization

Edited by GEORGE SARTON, D.Sc.

Associate of the Carnegie Institution

Harvard Library 183, Cambridge, Mass.

The chief feature of Isis is a Critical Bibliography of the History and Philosophy of Science and of the History of Civilization. The three first volumes (1882 pages) contain about 5,620 bibliographic notes, 312 reviews and 43 longer papers. Isis is the main center of information on the History and Philosophy of Science, and the organ of the New Humanism. 2 or 3 parts complete a volume within 12 to 18 months.

The 1st part (220 p.) of Vol. IV has appeared. Each volume costs 50 Belgian francs (about $3) (ed. de luxe, from vol. II on, 100 francs).

Publisher: WEISSENBRUCH

49 rue du Poincon Bruxelles, Belgium

"TURTOX" CATALOGS include

Aquaria
Bird glasses
Charts
Chemicals
Dissecting outfits
Earthworms (special)
Entomological supplies
Glassware
Lantern Slides
Life Histories
Microscopes
Microscope slides, (General)
Microscope slides, (special for High Schools)
Microtomes
Models
Museum Preparations
Preserved Material for Botany, Embryology and Zoology
Insect Mounts
Skeletons
Syringes, Injecting
Vascula

and many other items.

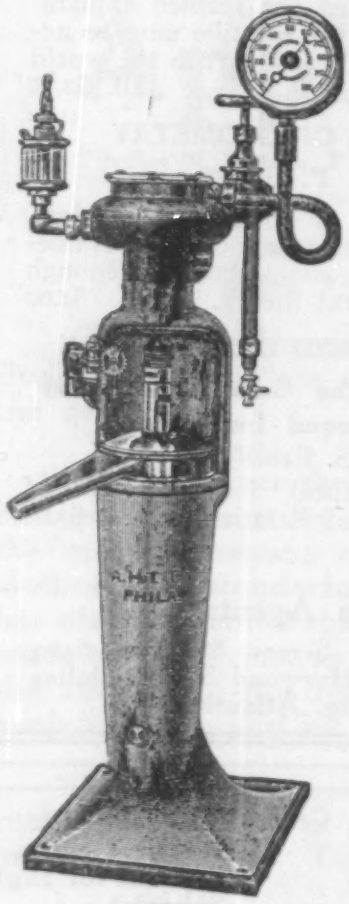
Items in black type are our own special products. We are Manufacturers and Preparators of Biological Supplies.

Catalogues to Cover any or all of the above items will be sent on request.

GENERAL BIOLOGICAL SUPPLY HOUSE
1177 EAST 55TH STREET, CHICAGO, ILL.

SHARPLES SUPER-CENTRIFUGE

MEDICAL LABORATORY MODEL



3181

THE TEST

IN OUR STOCK FOR IMMEDIATE SHIPMENT

OF SERVICE

The Sharples Laboratory Super-Centrifuge is an instrument for the application of very high centrifugal force to liquids. The machine does not resemble the tube or bottle centrifuge but is continuous in its operation—liquid is passed continuously through the rotating member where it is subjected to a force of 41,250 times the force of gravity, and the liquid is then continuously discharged. In this way the volume of liquid that can be handled per hour is limited only by the rate at which a proper centrifugal treatment can be effected.

In the M. L. (Medical Laboratory) Model, for Bacteriological and Serological Work, the bowl is provided with one outlet and with one collecting cover and delivery spout. The M. L. Model has been widely used in U. S. Army and other laboratories in the preparation of pneumococcus vaccine and by the large manufacturers of other biological preparations in the separation of various immunitive sera and the collection of bacterial matters, as well as for the clarification of agar, of gelatine, of broth, and other components of culture media.

3181. **Super-Centrifuge, Sharples Medical Laboratory Model,** with bowl provided with one outlet and with one collecting cover and delivery spout. With steam or compressed air turbine drive for continuous operation at a maximum speed of 40,000 r.p.m., requiring a steam pressure of 22 lbs. and consuming 100 lbs. of steam per hour. When operated by compressed air the same pressure is required and the consumption is 16 cu. ft. of air per minute ---------- **$160.00**

NOTE—Where neither steam nor compressed air is available, the centrifuges can be operated with crank for hand drive, by which method an approximate maximum speed of 25,000 r.p.m. is obtainable; or with electric drive, by which method an approximate maximum speed of 36,000 r.p.m. is available. A motor of ¼ h.p., with a speed of 1750 r.p.m., and a three-inch pulley is required. As the great advantage of the super-centrifuge results from the high speeds obtainable with the turbine drive, we furnish the hand drive and electric motor drive on special order only.

Prices subject to change without notice.

ARTHUR H. THOMAS COMPANY

WHOLESALE, RETAIL AND EXPORT MERCHANTS

LABORATORY APPARATUS AND REAGENTS

WEST WASHINGTON SQUARE PHILADELPHIA, U. S. A.

CABLE ADDRESS, "BALANCE," PHILADELPHIA

CORNELL UNIVERSITY MEDICAL COLLEGE

First Avenue and Twenty-eighth Street

NEW YORK CITY

For Information Address

THE SECRETARY

477 First Avenue

NEW YORK, N. Y.

Johns Hopkins University

Medical School

The Medical School is an Integral Part of the University and is in the Closest Affiliation with the Johns Hopkins Hospital.

ADMISSION

Candidates for admission must be graduates of approved colleges or scientific schools with at least two years' instruction, including laboratory work in chemistry, and one year each in physics and biology, together with evidence of a reading knowledge of French and German.

Each class is limited to 75 students, men and women being admitted on the same terms. **Except in unusual circumstances, applications for admission will not be considered after July 1st.**

If vacancies occur, students from other institutions desiring advanced standing may be admitted to the second or third year provided they fulfill all of our requirements and present exceptional qualifications.

INSTRUCTION

The academic year begins the Tuesday nearest October 1 and closes the second Tuesday in June. The course of instruction occupies four years and especial emphasis is laid upon practical work in the laboratories, in the wards of the Hospital and in the Dispensary.

TUITION

The charge for tuition is $300 per annum, payable in three installments. There are no extra fees except for rental of microscope, certain expensive supplies, and laboratory breakage.

The annual announcement and application blanks may be obtained by addressing the

Dean of the Johns Hopkins Medical School
Washington and Monument Sts., Baltimore, Md.

SUMMER WORK FOR GRADUATES IN MEDICINE

Beginning Tuesday, June 6th, and ending Thursday, July 16th, a course in medical diagnosis, including laboratory exercises in clinical pathology and demonstrations in pathological anatomy, will be offered. The course will be limited to **thirty** students, fee $100. Applications should be made to the Dean's Office.

Tulane University of Louisiana

SCHOOL OF MEDICINE

(Established in 1834)

ADMISSION: All students entering the Freshman Class will be required to present credits for two years of college work, which must include Chemistry (General and Organic), Physics and Biology, with their laboratories, and at least one year in English and one year in a modern foreign language.

COMBINED COURSES: Premedical course of two years is offered in the College of Arts and Sciences, which provides for systematic work leading to the B.S. degree at the end of the second year in the medical course.

School of Pharmacy, School of Dentistry and Graduate School of Medicine also.

WOMEN ADMITTED TO ALL SCHOOLS OF THE COLLEGE OF MEDICINE

For bulletins and all other information, address

Tulane College of Medicine
1551 Canal Street New Orleans, La.

YALE UNIVERSITY

SCHOOL OF MEDICINE

Affiliated with the New Haven Hospital and New Haven Dispensary

110TH SESSION

Reorganized on a full-time basis

Entrance Requirements: A minimum of three years (or its equivalent) of college including general biology, physics, general and organic chemistry, physical chemistry or laboratory physics, and either French or German.

ALL THE GENERAL FACILITIES OF THE UNIVERSITY ARE AVAILABLE TO MEDICAL STUDENTS

As the number admitted to each class is limited, applications must be made before July 1.

Dean, Yale University School of Medicine

NEW HAVEN, CONN.

University of Michigan
MEDICAL SCHOOL

THE University of Michigan Medical School requires a minimum of two years of college work for admission, the same to include English, chemistry (general, qualitative analysis and organic), physics, biology and either French or German. In addition to the above requirements the application must be accompanied by a statement from the proper authority in the school from which the applicant comes recommending him for admission to the Medical School.

Applications for admission must be filed on or before July 15, 1922.

The next regular session begins September 26, 1922.

For announcement and further information, address

The Secretary, Medical School
Ann Arbor, Michigan

SCHOOL OF MEDICINE
Western Reserve University
of
Cleveland, Ohio

¶ High Standard of Admission*
¶ Restricted Classes
¶ Thorough Instruction
¶ Large Clinical Facilities
¶ High Standard of Scholarship

*Admission confined to students having academic degrees and to Seniors in Absentia.

For information, address:
THE REGISTRAR, 1353 East 9th Street
CLEVELAND

Marine Biological Laboratory
Woods Hole, Mass.

INVESTIGATION
Entire Year
Facilities for research in Zoology, Embryology, Physiology, and Botany. Eighty-four private laboratories $100 each for not over three months. Thirty tables are available for beginners in research who desire to work under the direction of members of the staff. The fee for such a table is $50.00.

INSTRUCTION
June 28 to August 8, 1922
Courses of laboratory instruction with lectures are offered in Invertebrate Zoology, Protozoology, Embryology, Physiology and Morphology and Taxonomy of the Algae. Each course requires the full time of the student. Fee, $75. A lecture course on the Philosophical Aspects of Biology and Allied Sciences is also offered.

SUPPLY DEPARTMENT
Open the Entire Year

Animals and plants, preserved, living, and in embryonic stages. Preserved material of all types of animals and of Algae, Fungi, Liverworts and Mosses furnished for classwork, or for the museum. Living material furnished in season as ordered. Microscopic slides in Zoology, Botany, Histology, Bacteriology. Catalogues of Zoological and Botanical material and Microscopic Slides sent on application. State which is desired. For catalogues and all information regarding material, address:

GEO. M. GRAY,
Curator, Woods Hole, Mass.

The annual announcement will be sent on application to The Director, Marine Biological Laboratory, Woods Hole, Mass.

BOSTON UNIVERSITY
SCHOOL OF MEDICINE
Founded 1873

Students Limited to Two Hundred

ENTRANCE REQUIREMENTS.
Two pre-medical college years, including Chemistry, Physics, Biology, English and one other modern language.

CURRICULUM. Broad, liberal, meets all requirements.

LABORATORY AND CLINICAL FACILITIES. Ample.

MEN AND WOMEN ADMITTED ON EQUAL TERMS.
Fifth optional year, leading to Master's degree.

For information and catalogue, write to
EDWARD E. ALLEN, M. D., Registrar,
80 East Concord Street
Boston, Massachusetts

Freas Constant Temperature Electric Ovens

FREAS OVEN NO. 100

A general purpose drying Oven. It has satisfactorily aided many scientists in their work. It may help you. For sale by all dealers.

Manufactured by

THE THERMO ELECTRIC INSTRUMENT CO.,

No. 8 Johnson St., Newark, N. J.

ELECTRICAL MEASURING INSTRUMENTS

FOR PHYSICISTS AND PHYSICAL CHEMISTS

EQUIPMENTS SUITABLE FOR RESEARCH AND INDUSTRIAL LABORATORIES

We Solicit Inquiries

LEEDS & NORTHRUP CO.

4901 STENTON AVENUE PHILADELPHIA

REACTIONS OF SOILS

May be quickly and accurately determined through use of the

"LAMOTTE" INDICATOR FIELD SET

Complete with instructions. **$4.25** (delivered)

H-Ion concentration of water and solutions quickly and easily determined by the

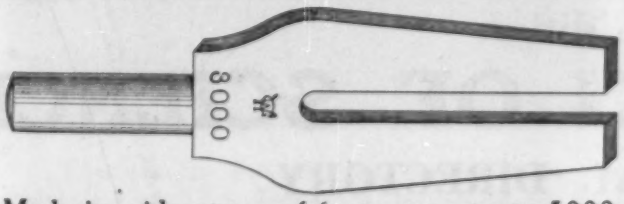
"LAMOTTE" H-ION COMPARATOR SET

Complete and ready for use. **$9.10** (delivered)

SEND FOR LITERATURE

LaMotte Chemical Products Co.

Baltimore, Md., U. S. A.



PRECISION

Tuning Forks

Made in wide range of frequency up to 5000 vibrations. Twenty-five years of experience have placed us in position to guarantee absolutely accurate rating. In rating our Forks we use a standard supplied by Dr. D. C. Miller, of the Case School of Applied Science, Cleveland, Ohio. Our electrically maintained Forks are well known for their convenient mountings permitting of great range of adaptability.

WM. GAERTNER & CO., 5345-49 Lake Park Ave., Chicago, Ill.

INSTRUCTOR IN ZOOLOGY

A man with M.A. or Ph.D. degree wanted as instructor in Zoology in West Virginia University. Address, Zoology Department, Morgantown, West Virginia.

The Microscope

By SIMON H. GAGE of Cornell University

13th Edition, Published December, 1920

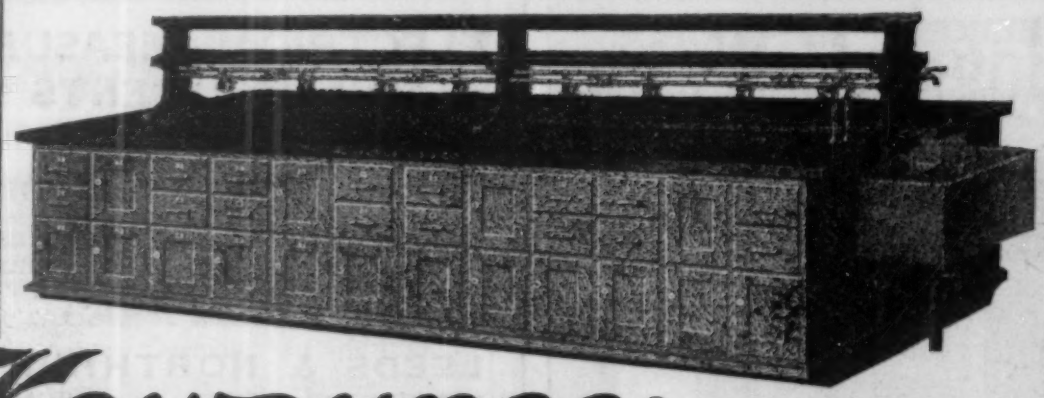
In this edition, special emphasis is put upon the Dark-Field Microscope. POSTPAID $3.00.

COMSTOCK PUBLISHING CO., Ithaca, N. Y.

Advertiser, forming Library, wishes to purchase second-hand books on Botany, Biology, Mycology, Chemistry, Physics, Agriculture, Technology and General Science. State edition and lowest prices to:

Mycologist, Mundakayam, Travancore, India

Chemist, M. S. Wide experience in teaching general analytical, organic and nutritional chemistry desires position. Prefer research or teaching. Good knowledge of animal and plant nutrition. Address: "W," c|o Science, 2619 Grand Central Terminal, New York City.



Kewaunee
LABORATORY FURNITURE

"We purchased Kewaunee Furniture for our Chemistry and Physics Laboratory ten years ago, and it is still in very good condition. The tables seem to be of well seasoned lumber and the workmanship is of good order. All of the pieces have stood up well."

This extract is from a letter from C. C. Schmidt, Superintendent of the University High School of the University of North Dakota.

An interesting new Book tells the Kewaunee story. It is free. Address the home office at Kewaunee.

CANADIAN SALES DIVISION,
615 Yonge Street,
TORONTO, CANADA

Kewaunee Mfg. Co.
LABORATORY FURNITURE EXPERTS
115 Lincoln St., Kewaunee, Wis.

NEW YORK OFFICE,
70 Fifth Avenue

BRANCH OFFICES:—
Chicago, Kansas City, San Francisco, Houston, Denver, Minneapolis, Baton Rouge, Columbus, Little Rock, Spokane, Oklahoma City, Jackson, Miss.; Phoneix, Omaha, Albuquerque, Salt Lake City, Greensboro, N. C.

Third Edition

AMERICAN MEN OF SCIENCE

A BIOGRAPHICAL DIRECTORY

EDITED BY J. McKEEN CATTELL AND DEAN R. BRIMHALL

The third edition of the Directory contains about 9,600 sketches as compared with 4,000 in the first edition and 5,500 in the second edition. The work should be in the hands of all those who are directly or indirectly interested in scientific work.

(1) Men of science will find it indispensable. It gives not only the names, addresses, scientific records and the like of their fellow workers, but also an invaluable summary of the research work of the country, completed and in progress.

(2) Those interested in science, even though they may not be professionally engaged in research work, will find much of interest and value to them in the book.

(3) Executives in institutions of learning and others brought into relations with scientific men will use the book constantly.

(4) Editors of newspapers and periodicals will find it to be one of the works of reference that they will need most frequently.

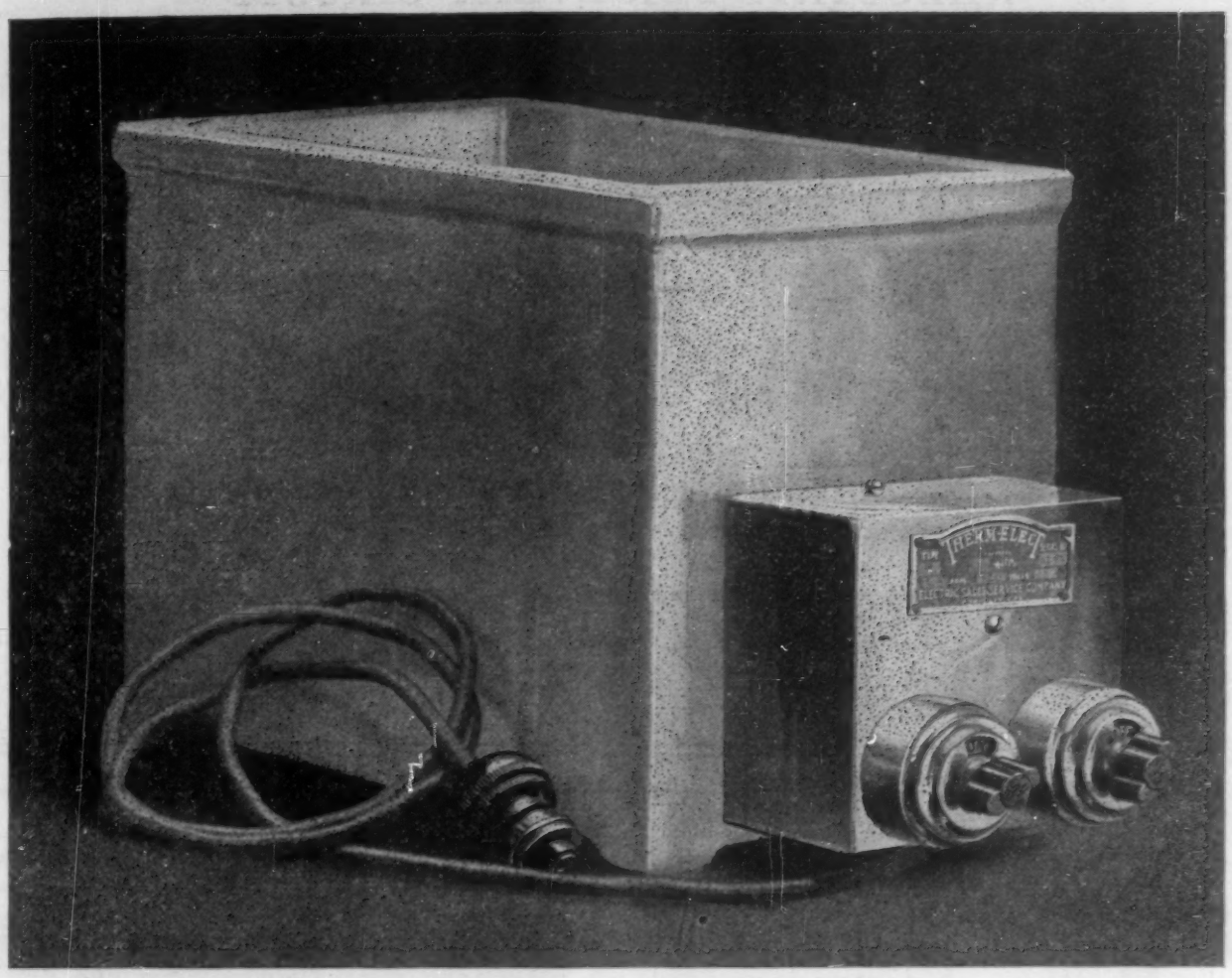
(5) Libraries will find the book to be a necessary addition to their reference shelves.

Price, Ten Dollars, Net, Postage Paid

THE SCIENCE PRESS

Grand Central Terminal, New York, N. Y.

Serological Water Bath of Precision



Electrically heated and temperature controlled serological water baths capable of operating at 37.5 degrees Centigrade or 56 degrees Centigrade, either temperature may be obtained by a simple turn of the indicative snap switch. The Wassermann test and inactivating work may be accomplished in the same bath. An Immersion electric heater which is entirely surrounded by water and extends the full length of the bath is used. The thermostats are the multiple contact type, capable of repeated heating and cooling without changing the adjustment. Should other working temperatures be desired the adjustment screw on the thermostat permits the temperature to be readily changed. Baths may be had from stock in the following sizes:

PORCELAIN BATHS

12½ in. x 6 in. x 5 in. Double temperature, Price---------- $55.00
12½ in. x 6 in. x 5 in. Single temperature, Price---------- 50.00

BRAUN-KNECHT-HEIMANN-CO.

Founded 1852

584 Mission Street **San Francisco, Calif.**

LABORATORY SUPPLIES

Apparatus **Chemicals**

Scientific Instruments

"We know how to pack for export"

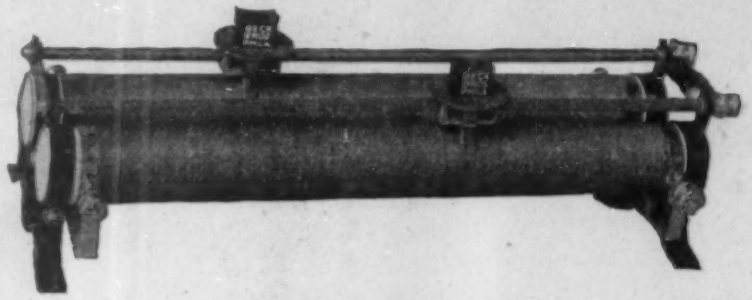
Inventors—Manufacturers—Exporters—Distributors

Cable Address, "BRAUNDRUG"
All Codes used.

Los Angeles House
The Braun Corporation

"BECBRO"

RHEOSTATS FOR EVERY CIRCUIT



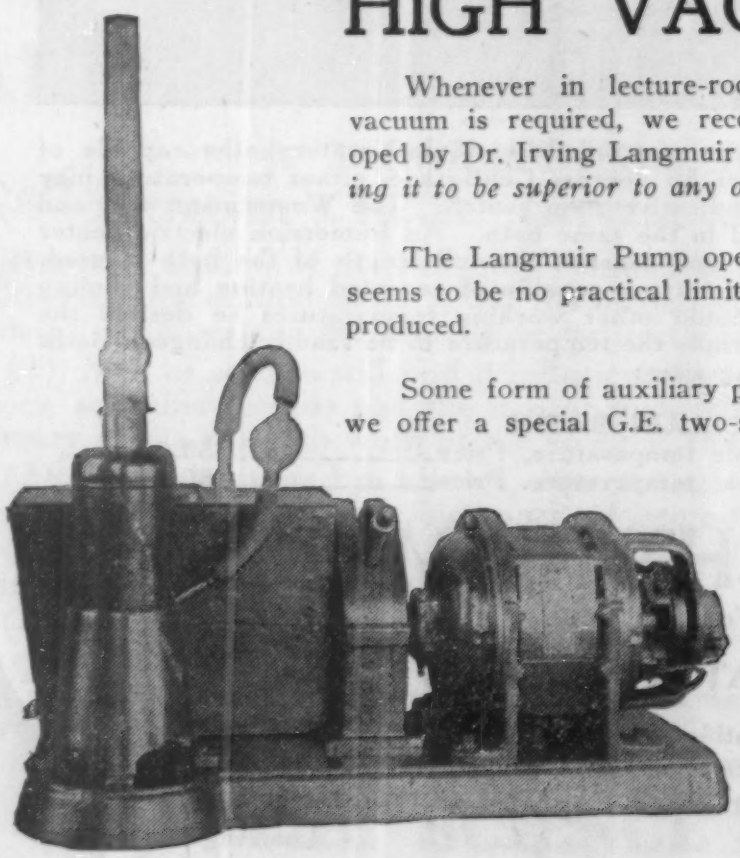
Tubular, Stone and Carbon Compression Types

Send for Bulletin C-10 which shows many types of rheostats made by us.

BECK BROS.

3640-42 N. Second Street Philadelphia, Pa., U. S. A.

HIGH VACUUM PUMPS



Whenever in lecture-room or laboratory practice, really high vacuum is required, we recommend the Condensation Pump developed by Dr. Irving Langmuir of the General Electric Company—*believing it to be superior to any other as yet obtainable.*

The Langmuir Pump operates with surprising rapidity, and there seems to be no practical limit to the degree of exhaustion that can be produced.

Some form of auxiliary pump must be used; and for that purpose we offer a special G.E. two-stage oil-sealed mechanical pump, which is capable of producing a vacuum of 0.001 mm. when used alone.

The picture shows a complete outfit comprising Langmuir Condensation Pump, two-stage auxiliary pump and ½ H.P. motor—all mounted together on one base.

Write for descriptive bulletin S-965

JAMES G. BIDDLE
1211-13 Arch St., Philadelphia